THE NATIONAL GEOGRAPHIC MAGAZINE

Vol. XIV APRIL, 1903 No. 4

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From a photograph by Chief Engineer H. W. Spear, R. C. S.

Herd of Reindeer Crossing a River in Siberia

VOL. XIV, No. 4 WASHINGTON APRIL, 1903

THE NATIONAL GEOGRAPHIC MAGAZINE

REINDEER IN ALASKA

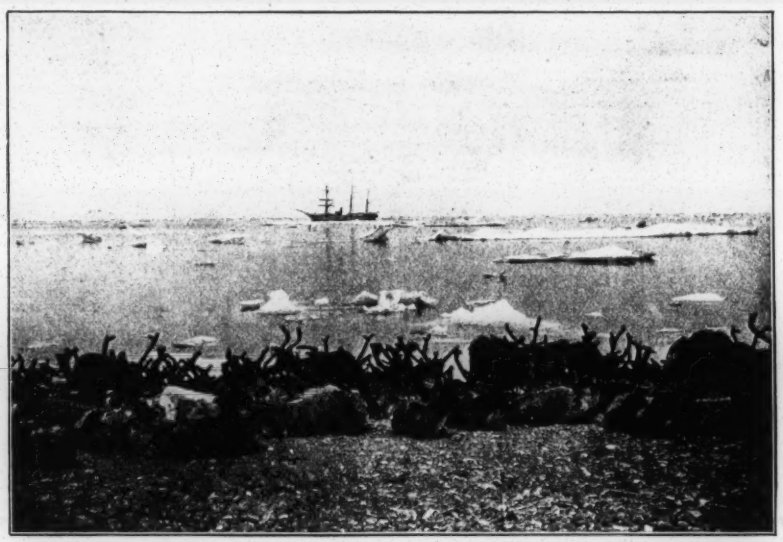
BY GILBERT H. GROSVENOR

TWELVE years ago Dr Sheldon Jackson brought his first herd of 16 reindeer across Bering Strait from Siberia and started his reindeer colony at Unalaska, off the bleak coast of Alaska. Many then smiled at the experiment and declared his plan for stocking the great barrens of northwestern Alaska with thousands of the animals which for centuries had been indispensable to the natives of Lapland and Siberia was impracticable and wasteful of time and good money. But the experiment prospered from the very first. Other reindeer, numbering nearly 1,000 in all, during the succeeding years were brought over from Siberia. Today there are nearly 6,000 head in the various herds distributed along the Alaskan coast from Point Barrow to Bethel. The existence of the 20,000 natives of northwestern Alaska, as well as the success of the miners who are beginning to throng into the interior of the territory in the far north, are dependent upon these domestic reindeer; their clothing, their food, their transportation, their utensils, and their shelter are all furnished them by the reindeer.

The reindeer enterprise is no longer an experiment although still in its infancy. There are 400,000 square miles of barren tundra in Alaska where no horse, cow, sheep, or goat can find pasture; but everywhere on this vast expanse of frozen land the reindeer can find the long, fibrous, white moss which is his food. There is plenty of room for 10,000,000 of these hardy animals. The time is coming when Alaska will have great reindeer ranches like the great cattle ranches of the southwest, and they will be no less profitable.

The story of the inception and growth of the reindeer enterprise in Alaska is very interesting and is not generally known. During an extended trip of inspection of the missionary stations and government schools in Alaska in the summer of 1890*, Dr Sheldon Jackson was impressed with the fact that the natives in arctic and subarctic Alaska were rapidly losing the sources of their food supply. Each year the whales were going farther and farther north, beyond the reach of the natives who had

* Dr Sheldon Jackson first visited Alaska in 1877, in the interest of schools and missions. He made a second trip in 1879. Other visits followed, and since his appointment as General Agent of Education in Alaska in 1885 he has made annual visits to the territory.



From a photograph by R. N. Hawley, M. D.

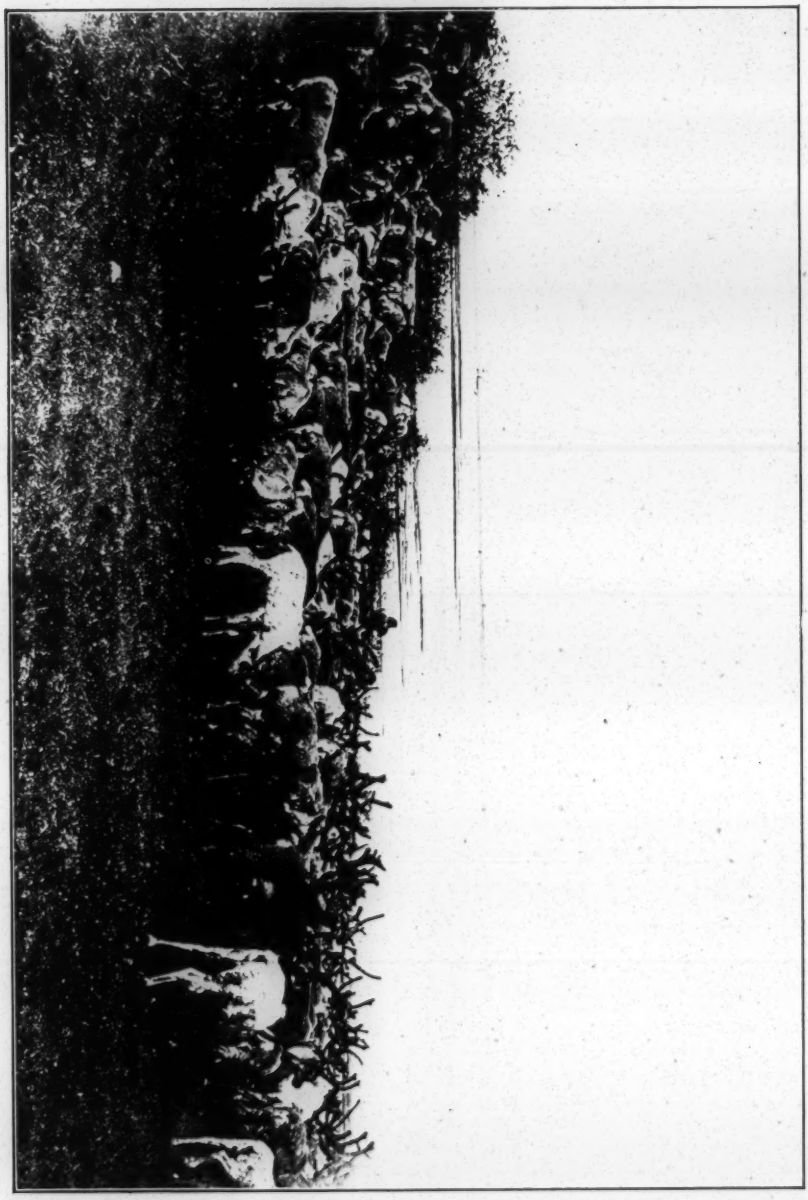
Reindeer on the Siberian Beach, Hobbled, waiting to be Loaded on the *Bear* for Transportation to Alaska

For 20 years the revenue cutter *Bear* has been engaged in Arctic work. It has saved the lives of hundreds of wrecked whalers, and contributed more to the comfort and safety of the settlements along the Alaskan coast than any vessel in the service.

no steamships in which to pursue them; the walrus, which formerly had been seen in herds of thousands, were disappearing; the seals were becoming exterminated, and in winter the Eskimo had to tramp 15 to 20 miles out on the ice before he could catch one. The modern hunter, with his steam launches and rapid-fire guns, had found the whales, walrus, and seals such easy prey that he was ruthlessly destroying them. Also the wild caribou, that the native had easily captured before, had been frightened away and was rarely seen.

Not only was the Eskimo losing his food, but what in an arctic climate is no less important, his clothing as well. The whalebone, the ivory tusks of the walrus, the seal skin, and the oil had given him means of barter with the Siberian traders across the Strait, from whom he obtained reindeer skins to keep him warm in winter.

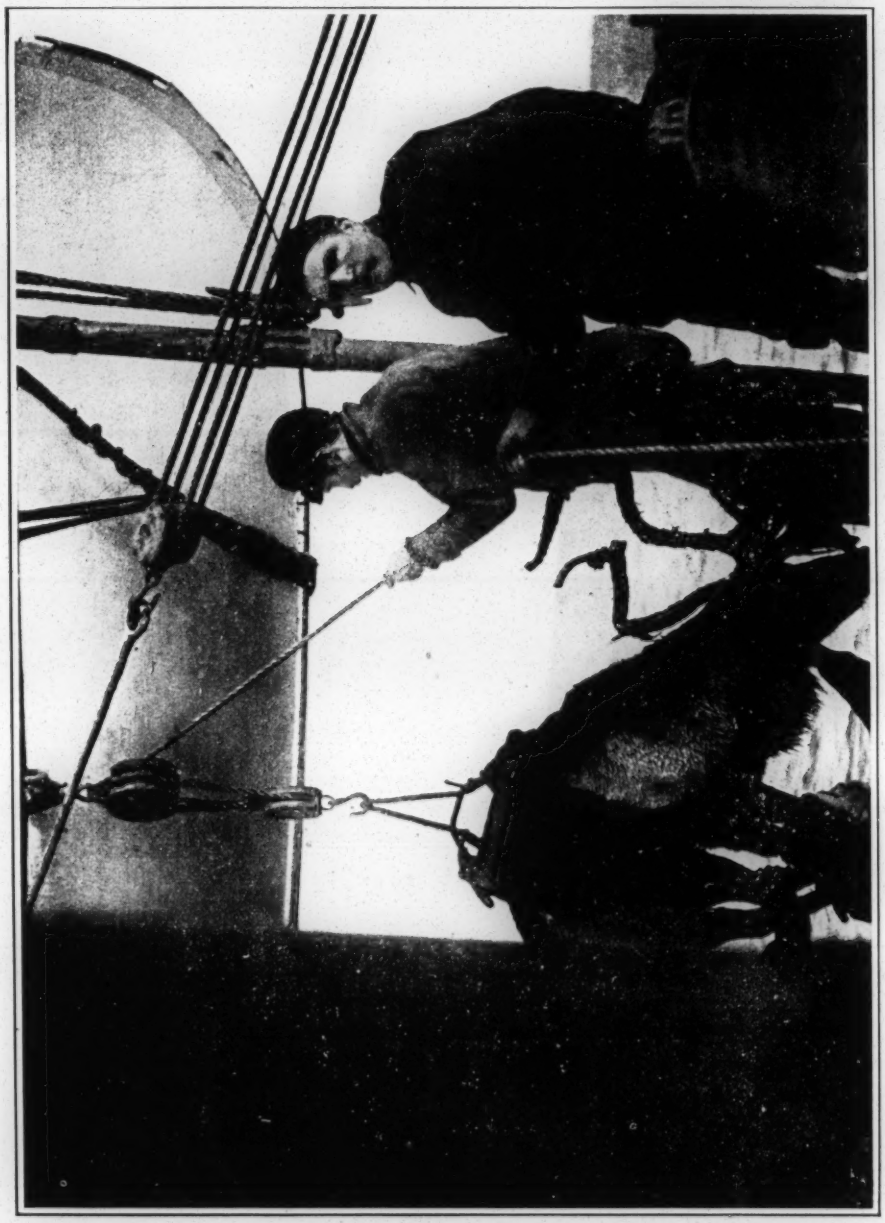
Dr Jackson saw that unless something was done at once the United States would have to choose between feeding the 20,000 and more natives or letting them starve to death. The latter course was impossible; the former rather expensive, as supplies would have to be carried some 3,000 miles from Seattle. The more enterprising Siberian, living on the opposite side of the Strait under practically the same conditions of arctic cold, got along very nicely, as he had great herds of domestic reindeer to fall back upon when game was scarce. The same moss which covered so many thousands of miles of the plains of arctic Siberia was seen everywhere in Alaska. The tame reindeer of Siberia was practically the same animal as the wild caribou of Alaska, changed by being domesticated for centuries. Could not the Eskimo be made self-supporting by giving him reindeer herds of his own?



Reindeer Herd, Siberia

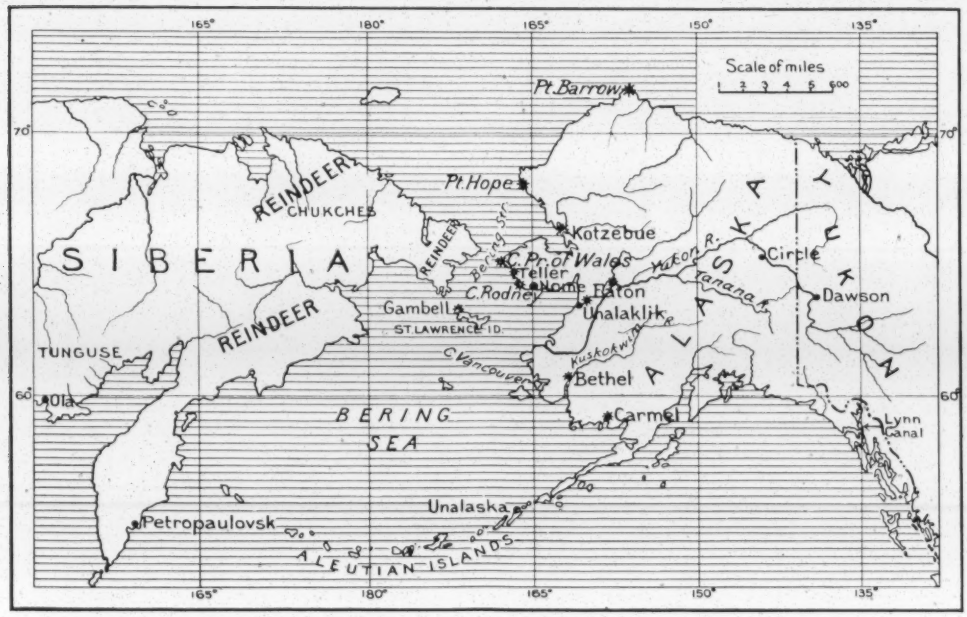
U. S. Revenue Cutter *Bear* in the offing

From a photograph by A. Weeks, M. D.



From a photograph by H. W. Spear, R. C. S.

Unloading Reindeer, St Lawrence Island, Alaska



Outline Map Showing Government Reindeer Stations in Alaska

On his return to the United States, during the winter of 1891, Dr Sheldon Jackson, in his annual report to Congress, asked for an appropriation to provide the money for importing a few deer. Congress was not convinced of the wisdom of such action, but several private persons were so interested that they placed $2,000 at Dr Jackson's disposal to begin the experiment; the first deer were brought over that year. It was not long, however, before the government realized the importance of the movement, and in 1894 appropriated the sum of $6,000 to continue the work. Later the appropriation was increased, and during the last several years has amounted to $25,000 annually.*

The Siberians were at first unwilling to part with any of their reindeer. They were superstitious and above all afraid of competition and loss of trade across the strait. Capt. M. A. Healy, who was commissioned to purchase the deer in 1891, was obliged to sail from village to village for 1,500 miles along the Si-

* Congressional appropriations for the introduction into Alaska of domestic reindeer from Siberia are as follows:

1894	$6,000	1900	$25,000
1895	7,500	1901	25,000
1896	7,500	1902	25,000
1897	12,000	1903	25,000
1898	12,500		
1899	12,500	Total	$158,000

Congress entrusts the general charge of the work to the Bureau of Education, of which Dr William T. Harris is the distinguished head; the formulation of plans and their execution is entrusted to Dr Sheldon Jackson, general agent of education in Alaska. Dr Harris, in his annual reports to Congress, has vigorously urged the importance of the work, and to him credit is due for a large share of its success. Capt. M. A. Healy and the many officers of the revenue cutter service, whose vessels have year after year carried the agents of the bureau back and forth and brought the reindeer from Siberia without charge, have also contributed to the success of the reindeer enterprise.

From a photograph by Kleinschmidt

Mr T. L. Brevig Starting on a Family Sleigh Ride, Teller Reindeer Station

berian coast before he found an owner willing to barter his reindeer for American goods. None would sell the deer for cash. Of recent years the Siberians have been but little less reluctant to part with their deer though they could easily spare many thousands from their vast herds without knowing it.

The first deer brought over were from the Chukches herds—a tough and hardy breed. Two years ago Lieutenant Bertholf was commissioned to go to Siberia and try to purchase some of the Tunguse stock, which are larger, stronger and sturdier. Starting from St Petersburg, after a long journey across Siberia, much of it by sled, he succeeded in purchasing several hundred Tunguse near Ola, hired a steamer, embarked the reindeer at Ola with 2,500 bags of reindeer moss, and finally landed 200 of the animals in good condition at Part Clarence. His experiences during his remarkable journey were most interesting, and are admirably described in his report to Dr Sheldon Jackson, published in 1902.*

From a photograph by E. P. Bertholf

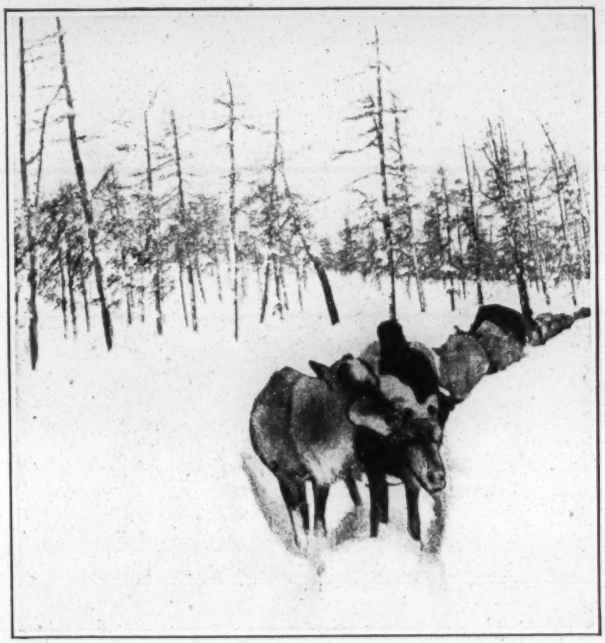
Traveling With Reindeer in Summer

THE ESKIMO AS HERDERS

With careful training the Eskimo make excellent herders. They are by nature good imitators, though not inventive, and readily learn how to take care of the reindeer, to throw the lasso, to harness and drive the deer, and to watch the fawns. Siberian herders were at first imported to teach them, and later the more intelligent and efficient Laplanders, who have learned by centuries

* "Report on the Introduction of Domestic Reindeer into Alaska." By Sheldon Jackson, LL. D., 1901. Appendix, Expedition to Siberia, report of Lieutenant E. P. Bertholf, pp. 130–168.

of experience to give to the breeding of reindeer the care that we give to the breeding of cattle. In the winter of 1898 sixty-three Laplanders and their families volunteered to go to Alaska, the U. S. Government paying the expenses of their long journey of 10,000 miles. When their term of enlistment expired some reënlisted, some of them went home again, but the majority turned miners. Every one will be glad to know that at least two-thirds of the whole number made large fortunes in the Cape Nome gold fields.



From a photograph by E. P. Bertholf

Breaking a Path Through Deep Snow

The reindeer herders have to be watchful. Now and then reckless miners try to plunder the herds, or by their carelessness set fire to the moss. A fire will sweep over the moss barrens, licking up every fiber of the moss, as it sweeps over our western prairies. A moss fire is even more destructive, for many years pass before the moss will grow again.

At the end of a year's service the government makes a gift to deserving herders of two or more reindeer.

REINDEER RAISING AS AN INDUSTRY

When one considers that raising reindeer in Alaska is simple and the profits enormous, one is surprised that as yet no one has really gone into the reindeer business, especially at Dawson, where a rich market awaits the reindeer farmer.

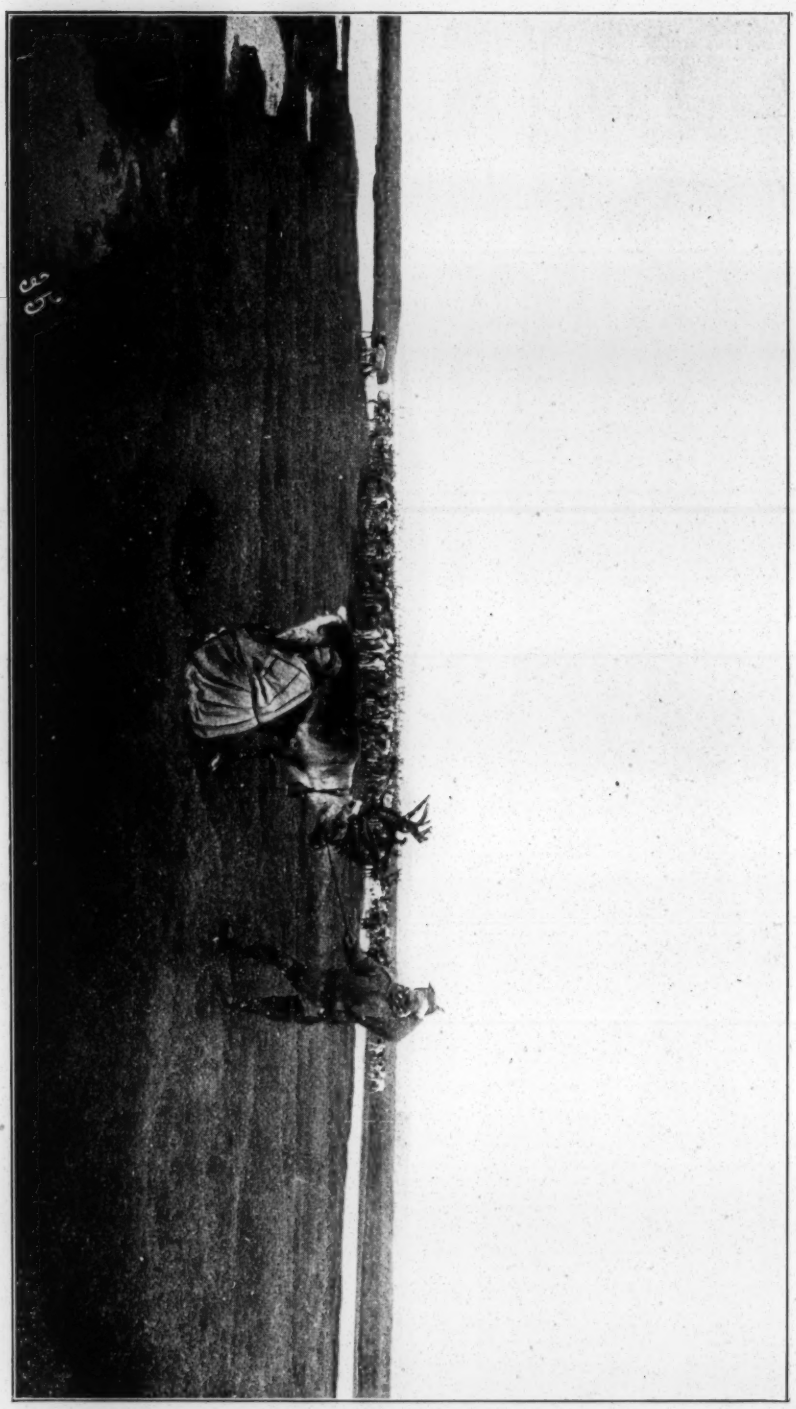
A fawn during the first four years costs the owner less than $1 a year. At the end of the four years it will bring at the mines from $50 to $100 for its meat, or if trained to the sled or for the pack, is easily worth $100 to $150.

The fawns are very healthy and but few die; the does are prolific, and after they are two years of age add a fawn to the herd each year for ten years. Last year, out of 50 does two years and more of age in one herd, 48 had fawns, and of these only five died, three of which were lost through accidents or by the carelessness of the herder.

The reindeer are so gregarious and timid that one herder can easily guard 1,000 head. The herder knows that if a few stray off he need not look for them as they will soon become frightened and rejoin the main herd.

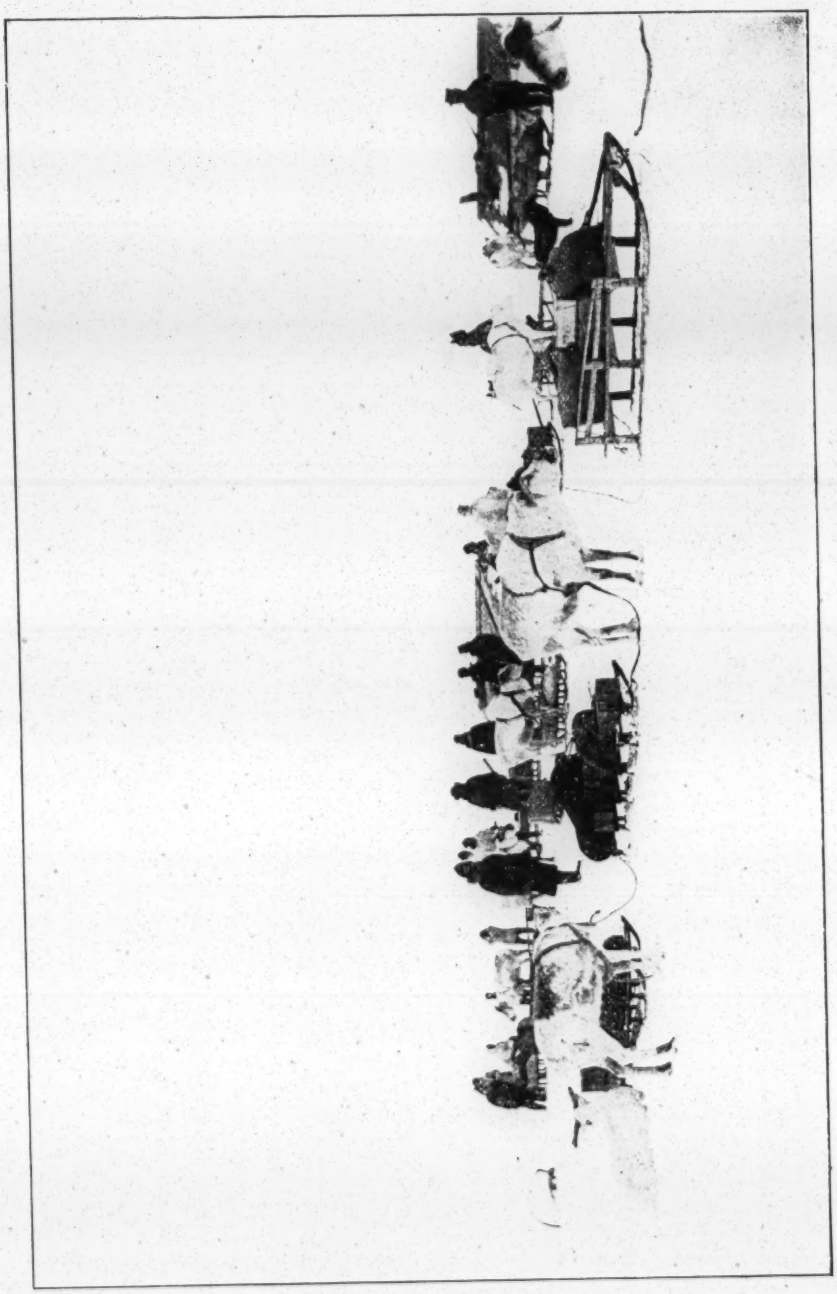
The does make almost as good sled deer as the bulls and geldings. They are slightly smaller and less enduring.

The Chukches deer cost in Siberia about $4.00 a head for a full-grown doe or bull. The fawns born in Alaska are larger and heavier than the parent stock.

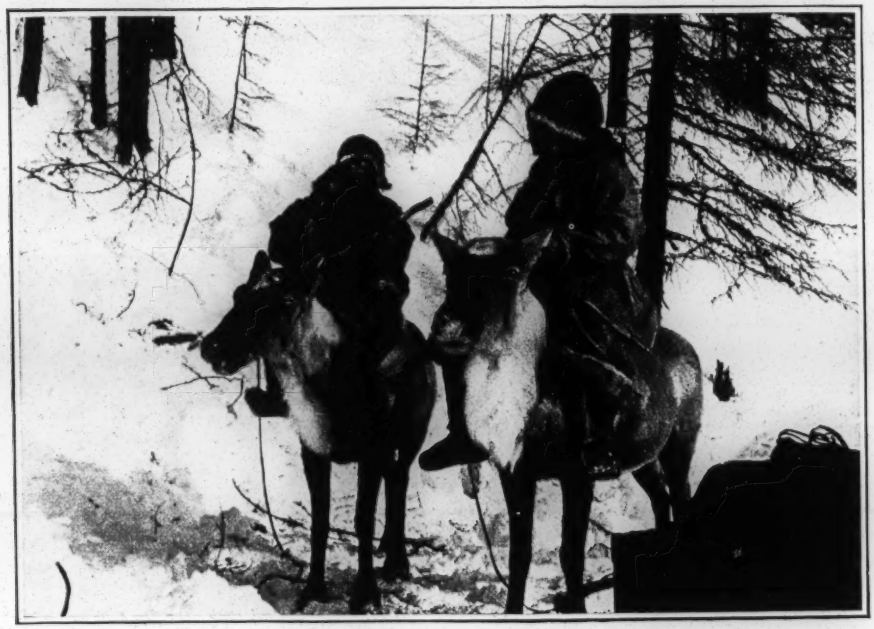


Milking Reindeer, Teller Reindeer Station

From a photograph by Tappan Adney



Freighting with Reindeer—Cape Prince of Wales



From a photograph by E. P. Bertholf

Traveling Deerback Through Deep Snow

The Tunguse deer cost nearly $7.50 apiece. By the addition of the Tunguse breed it is hoped that the Alaska stock will be improved and toughened.

The reindeer cow gives about one teacupful of very rich milk, nearly as thick as the best cream, and making delicious cheese. Mixed with a little water, the milk forms a refreshing drink. The Siberians and Laplanders save the blood of slaughtered deer and serve it in powdered form. From the sinews tough thread is obtained.

REINDEER EXPRESS

The Alaskan reindeer can hardly equal the speed of the Lapland deer, which Paul du Chaillu* describes as making from 150 to 200 miles a day, and sometimes 20 to 25 miles down hill in a single hour. A pair of them can pull a load of 500 to 700 pounds at the rate of 35 miles a day and keep it up weeks at a time. W. A. Kjellmann drove his reindeer express one winter 95 miles in a single day.

Reindeer teams during the past winter carried the United States mail from Nome to Candle City, on the Arctic Ocean, a distance of 260 miles. The teams had heavy loads of passengers and freight and made the distance in eight days. Dog teams would have required fifteen to twenty days for the trip.

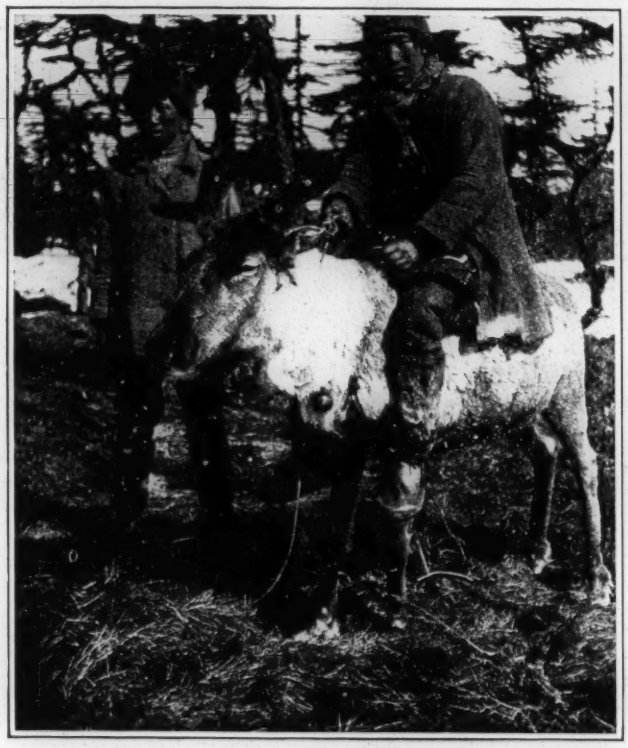
The reindeer can travel at night as well as in the daylight, and thus during the long Arctic night when dogs are inefficient transportation is always possible with a reindeer team.

The reindeer make good packers in summer. One hundred and fifty pounds is a fair load. They also can be ridden

*"The Land of the Long Night," Paul du Chaillu. Chas. Scribner's Sons.

in the saddle, but not with much comfort until the rider learns how to adjust himself. In the Tunguse country the natives use their deer in summer as we would a mule or horse. It is no uncommon sight to see a Tunguse trotting along the shore deerback.

Lieutenant Bertholf describes the caravans of reindeer sleds in northeastern Alaska. Over 1,000 sleds leave Ola (see map) during the winter in caravans of about 100 each. A caravan of 100 sleds is managed by 10 men. Some years ago the Russian Government used horses on the caravan route from Ola to the Kolima River, but recently substituted reindeer, and now saves $60,000 yearly by the change.



From a photograph by E. P. Bertholf

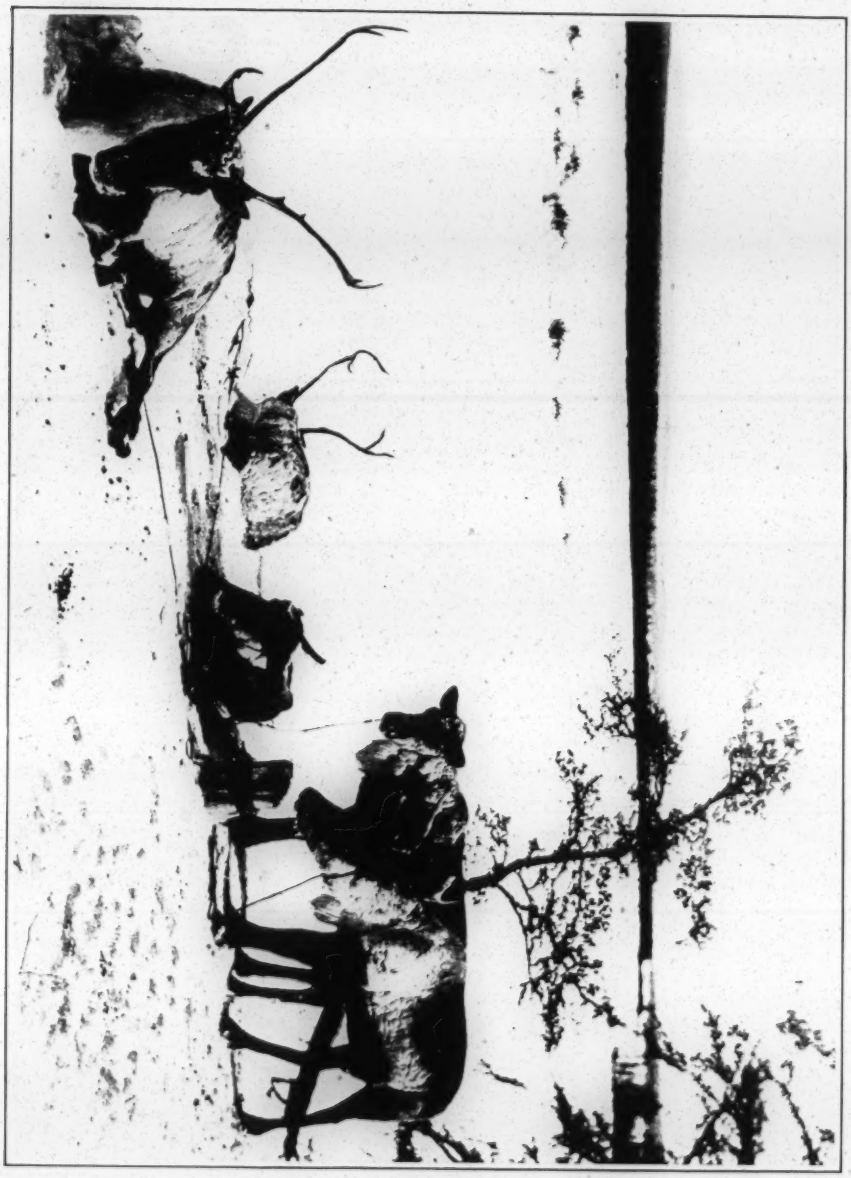
Riding in Summer

The illustration* on page 134 shows the leaders of Lieutenant Bertholf's party breaking a path through snow that reached to the belly of the deer. A strong wiry deer, unmounted, was driven first. In the deep snow he could advance only by jumps, but his leaps broke the way somewhat for the next few deer, who were also unmounted. After a dozen or more unmounted deer had passed by, deer ridden by a boy and girl broke the path still further until deer with heavy loads could pass. Lieutenant Bertholf in this way broke his path for 160 miles through the deep snow.

When the caravan halts the deer are turned out to pasture untethered and allowed to wander as they will. The driver uses a switch to touch up the slothful, but "some of the old deer do not seem to mind a switch any more than does an army mule."

The illustration on page 142 shows a number of reindeer digging up the snow with their powerful hoofs to get at the moss beneath the snow. As soon as spring comes the deer abandons his diet of moss, which seems to be most nutritive in winter, for willow sprouts, green grass, and mushrooms. The hoof of the reindeer is as wide as that of a good-sized steer and prevents him from settling down into damp snow or miry soil.

*For the exceedingly interesting series of illustrations that accompany this article, the NATIONAL GEOGRAPHIC MAGAZINE is indebted to Dr Sheldon Jackson and Dr William Hamilton.



Tethered During a Halt

From a photograph by A. Weeks, M. D.

A Siberian Woman and Daughter

REINDEER LOANED BY THE GOVERNMENT

The U. S. Government loans a certain number of the reindeer to the mission stations, or to individuals who have shown their ability, reserving the right, after three or five years, of calling upon the mission station or the individual for the same number of deer as composed the original herd loaned. In 1894 the Congregational mission at Cape Prince of Wales was granted the loan of 100 deer. The mission has since paid back the loan, and now possesses in its own right one thousand head.

A few of the herds, notably that at Cape Prince of Wales, have grown so large that the owners are able to kill off some of the extra males for food for the families of the herders, and to sell others to the butchers in the neighboring mining camps. Last year deer for slaughter brought from $60 to $100 each, while for male deer trained to harness miners gave as much as $150 apiece. The herders at this same station earned last winter $600 in gold for freighting with their reindeer to the mining camps. The deer were worked in double trace harness like horses, and hauled on sleds 790 pounds each.

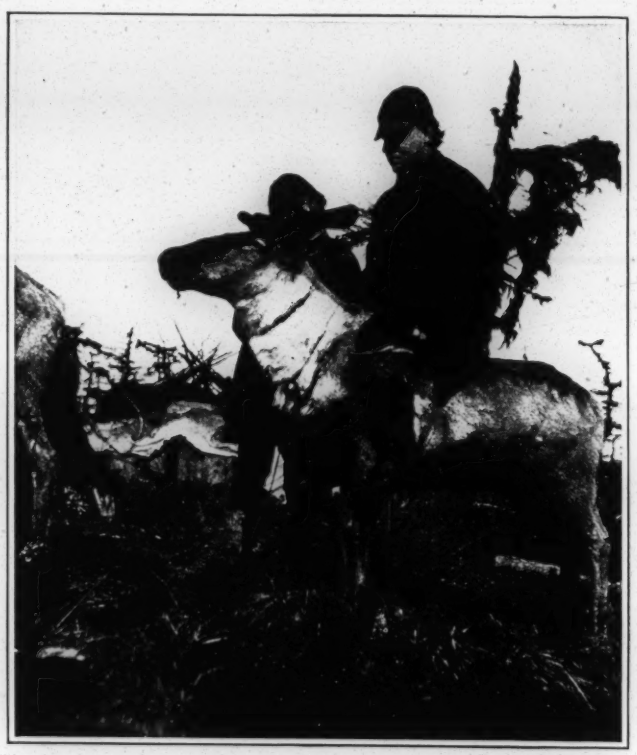
Of the 60 individual owners of domestic reindeer in Alaska today, 44 are Eskimo. Most of them have served a five-year apprenticeship, and having earned their deer are competent to care for them.

Each owner has his own individual mark, which is branded on the left or right ear of each of his deer.

IMPORTANCE OF REINDEER TO MISSION STATIONS

The Bureau of Education hopes that in time each mission station will possess a herd of at least 5,000 head. A reindeer herd at a mission station in arctic or subarctic Alaska means, says Dr Jackson:

First. The permanence of the mission. Without it the natives are away from home a larger portion of the year in search of food, and, since the advent of the miners, are inclined to leave their



Lieutenant Bertholf Mounted on Reindeer, Showing the Ability of the Reindeer to Carry 210 Pounds

Copyright, 1899 Charles Scribner's Sons

Reindeer Digging Up the Snow to Get the Moss Beneath

Republished from "Land of the Long Night," by Paul du Chaillu, by courtesy of the publishers

homes and congregate in the American villages at the mines, where they live by begging and immorality and soon disappear from the face of the earth.

Second. It affords the missionary the opportunity of rewarding and encouraging those families that give evidence of being teachable by establishing them in the reindeer industry, and thus greatly promoting their material interests.

Third. With the increase of the herd it becomes a source of revenue through the sale of the surplus males at remunerative prices to the miners and butchers. In a few years this revenue should be sufficient to entirely support the mission and thereby relieve the treasury of the central Missionary Society.

Fourth. The possession of a herd insures to the mission family a continuous supply of fresh meat. This to a family which is compelled to live largely upon salted and canned meats and canned vegetables is of no small benefit, promoting their comfort, health, and usefulness.

Fifth. Reindeer trained to harness and sleds greatly increase the efficiency and the comfort of the missionary in ministering to outlying native settlements.

REINDEER FROM LAPLAND

The vast majority of the American people have an idea that the reindeer experiment in Alaska proved a failure long ago, simply because of the widely advertised unsuccessful attempt in 1898

From a photograph by A. Weeks, M. D.

A Siberian, the Owner of 10,000 Head of Reindeer, and a Cossack Official

From a photograph by Bernardi

Pupils of Public School, Cape Prince of Wales, 1902

of bringing deer from Lapland. Only once have reindeer been brought from Europe for Alaska, and that attempt was unsuccessful, not because the reindeer could not live in their new home, but because of the wretched transportation given them from Seattle to their Alaskan destination.

In December, 1897, rumors were started that American miners in the Yukon Valley were in danger of starvation. Congress appropriated a large sum for their relief, and commissioned Dr Sheldon Jackson to go to Norway and Sweden to purchase 500 reindeer broken to the harness, with sleds, harness and drivers, for hauling supplies from the head of Lynn Canal to the destitute miners, 1,000 miles away.

Dr Jackson reached Europe in January, purchased 526 trained deer, gathered 68 Lapp drivers with their families, embarked them all on one ship, and sailed for New York from Trondhjem, February 4. Only one deer died on the voyage of 24 days, though the trip was a most tempestuous one and the deer in pens on the deck were drenched day and night by the seas that broke over them. At New York special trains met the expedition and carried them across the continent to Seattle without the loss of a single deer. Then the troubles began. The supply of moss brought from Norway became exhausted, and the deer did not like the grass of Seattle. There was delay in securing a vessel to transport the expedition to the head of Lynn Canal, and further delays at Lynn Canal and no moss to be found there.

Nearly 300 of the reindeer died of starvation before the moss fields at the head of the Chilkat River, about 50 miles from Lynn Canal, were reached. The remaining 200 were too weakened to endure the long journey to the Yukon Valley, and the relief expedition had to be abandoned, but fortunately not before the country had learned that the miners in the Yukon had abundant supplies, and that the relief expedition had been unnecessary.

The Laplanders who had been brought over were distributed among the reindeer stations and employed to teach the natives.

RELIEF OF WHALERS AT POINT BARROW

The first forcible realization of the wisdom of the government in stationing reindeer herds in Alaska came to the American people in the winter of 1897–'98. In the fall of 1897 word was received that eight whaling ships had been imprisoned in the ice near Point Barrow, and that the 400 American seamen aboard were stranded without food for the long winter till the ice should open in July. No vessel of relief could get within 2,000 miles of the party, or nearer than Denver is to Boston. There was no known method by which provisions could be dragged overland. If the government had not five years before commenced the introduction of the reindeer, most of these 400 men would have starved to death before help reached them. Fortunately there were large herds of reindeer at Cape Nome and at Cape Rodney, over one thousand miles by land from Point Barrow, or farther than Chicago is from New York. The government hurried the revenue cutter *Bear* north from Seattle, carrying three brave volunteers—Lieut. David H. Jarvis, Lieut. Ellsworth P. Bertholf, and Dr Samuel J. Call The three men were landed December 16, 1897, at Cape Vancouver, obtained some dog teams from the natives, and commenced their dreary journey of 2,000 miles through the Arctic night to Point Barrow. They collected about 450 reindeer from the herds at Rodney and Nome, and then, with reindeer instead of dog sleds and with Mr W. T. Lopp, agent of the American Missionary Society at Cape Prince of Wales, and Charley Arisartook, a native, and several herders, they

pushed on through the storms and bitter cold of an Arctic winter, driving the deer before them. After a journey of three months and twelve days, on March 29, 1898, they reached the destitute whalers, just in time to save them from great suffering and death.

In heroism, pluck, and endurance the journey of these men has rarely been equaled. Congress voted its thanks to the gallant rescuers and awarded them special medals of honor, but in the excitement aroused throughout the country by the rapid succession of events of the Spanish-American war their work was almost unnoticed.

Since that time a reindeer herd has been kept at Point Barrow so there is no longer danger of ice-imprisoned whalers perishing from starvation. The experience also showed the faithfulness of the Eskimo. Mr Lopp had left his wife at his station; the only white person among 400 natives, but during his absence of nearly five months she received nothing but constant courtesy and kindness from them.

DEVELOPMENT OF ARCTIC AND SUBARCTIC ALASKA DEPENDENT ON THE REINDEER

The original motive in bringing the reindeer to Alaska was purely philanthropic—to give the native a permanent food supply.

Since then the discovery of large and valuable gold deposits upon the streams of arctic and subarctic Alaska has made the reindeer a necessity for the white man as well as for the Eskimo. Previous to the discovery of gold there was nothing to attract the white settler to that desolate region, but with the knowledge of valuable gold deposits thousands will there make their homes, and towns and villages are already springing into existence.

But that vast region, with its perpetual frozen subsoil, is without agricultural resources. Groceries, breadstuffs, etc., must be procured from the outside. Steamers upon the Yukon can bring food to the mouths of the gold-bearing streams, but the mines are often many miles up these unnavigable streams. Already great difficulty is experienced in securing sufficient food by dog-train transportation and the packing of the natives. The miners need reindeer transportation.

Again, the development of the mines and the growth of settlements upon streams hundreds of miles apart necessitate some method of speedy travel. A dog team on a long journey will make on an average from 15 to 20 miles a day, and in some sections cannot make the trip at all, because they cannot carry with them a sufficient supply of food for the dogs, and can procure none in the country through which they travel. To facilitate and render possible frequent and speedy communication between these isolated settlements and growing centers of American civilization, where the ordinary roads of the states have no existence and cannot be maintained except at an enormous expense, reindeer teams that require no beaten roads, and that at the close of a day's work can be turned loose to forage for themselves, are essential. The introduction of reindeer into Alaska makes possible the development of the mines and the support of a million miners.

The reindeer is to the far north what the camel is to desert regions, the animal which God has provided and adapted for the peculiar, special conditions which exist. The greater the degree of cold, the better the reindeer thrives. Last winter a party with a reindeer team made a day's journey with the temperature at 73 degrees below zero. On a long journey through an uninhabited country a dog team cannot haul sufficient provisions to feed themselves. A deer with 200 pounds on the sled can travel up and down the mountains and

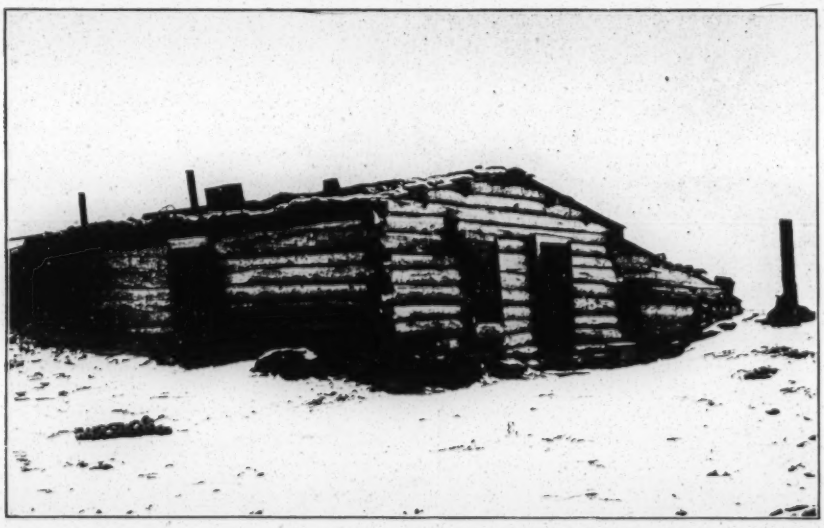
over the plains without a road or trail from one end of Alaska to the other, living on the moss found in the country where he travels. In the four months' travel of 2,000 miles, from Port Clarence to the Kuskokwim Valley and back, by Mr W. A. Kjellmann and two Lapps, with nine sleds, 1896–'97, the deer were turned out at night to find their own provisions, except upon a stretch of the Yukon Valley below Anvik, a distance of 40 miles.

The great mining interests of central Alaska cannot realize their fullest development until the domestic reindeer are introduced in sufficient numbers to do the work of supplying the miners with provisions and freight and giving the miner speedy communication with the outside world.

The reindeer is equally important to the prospector. Prospecting at a distance from the base of supplies is now impossible. The prospector can go only as far as the 100 pounds of provisions, blankets, and tools will last, and then he must return. With ten head of reindeer, packing 100 pounds each, making half a ton of supplies, he can go for months, penetrating regions hundreds of miles distant.

FUTURE OF REINDEER INDUSTRY

Even if no more reindeer are imported from Siberia, if the present rate of increase continues, doubling every three years—and there is no reason why it should not—within less than twenty-five years there will be at least 1,000,000 domestic reindeer in Alaska. This is a conservative estimate and allows for the deer that die from natural causes and for the many that will be slaughtered for food. In thirty-five years the number may reach nearly 10,000,000 head and Alaska will be shipping each year to the United States anywhere from 500,000 to 1,000,000 reindeer carcasses and thousands of tons of delicious hams and tongues. At no distant day, it may be



From a photograph by R. N. Hawley, M. D.

Formerly the residence of Rev. W. T. Lopp, Congregational Missionary, Cape Prince of Wales, Alaska, who for ten years labored at this settlement. Now the residence of Hugh T. Lee, who in 1895 accompanied Peary on his second advance across the Greenland ice cap to Independence Bay.

safely predicted, long reindeer trains from arctic and subarctic Alaska will roll into Seattle and our most western cities like the great cattle trains that now every hour thunder into the yards of Chicago. Before the end of the present century Alaska will be helping to feed the 200,000,000 men and women who will then be living within the present borders of the United States.

*REFERENCES: For further information on the introduction of domestic reindeer into Alaska, consult the annual reports of Sheldon Jackson, LL. D., General Agent of Education in Alaska, for 1891–1902. The reports contain much interesting matter about Alaska as well. They may be obtained from the Superintendent of Public Documents, Washington, D. C., for a small sum.

Special mention may be made of the following articles included in the reports:

"Domesticated Reindeer, with Notes on the Habits and Customs of the Eskimo and Life in Arctic Alaska," including many quaint native drawings, by Miner W. Bruce, pp. 25–117, 1893.

"The Itinerary of 1895" (describes a tour of inspection), by Dr William Hamilton, Assistant General Agent of Education in Alaska, pp. 21–41, 1895.

"Report of Wm. A. Kjellmann Describing a Trial Trip of 2,000 Miles with Nine Reindeer Sleds," pp. 41–71, 1897.

"The Lapland Reindeer Expedition of 1898," pp. 32–46, 1898.

"Expedition to Siberia," by Lieut. E. P. Bertholf, describing the purchase of Tunguse reindeer in Siberia, pp. 130–168, 1901.

"Reindeer in Siberia," pp. 168–175, 1901.

Mention should also be made of:

"The Cruise of the U. S. Revenue Cutter *Bear* and the Overland Expedition for the Relief of the Whalers in the Arctic Ocean, November 27, 1897, to September 13, 1898," including reports of Lieut. D. H. Jarvis, Lieut. E. P. Bertholf, and Surgeon S. J. Call. Government Printing Office, 1899.

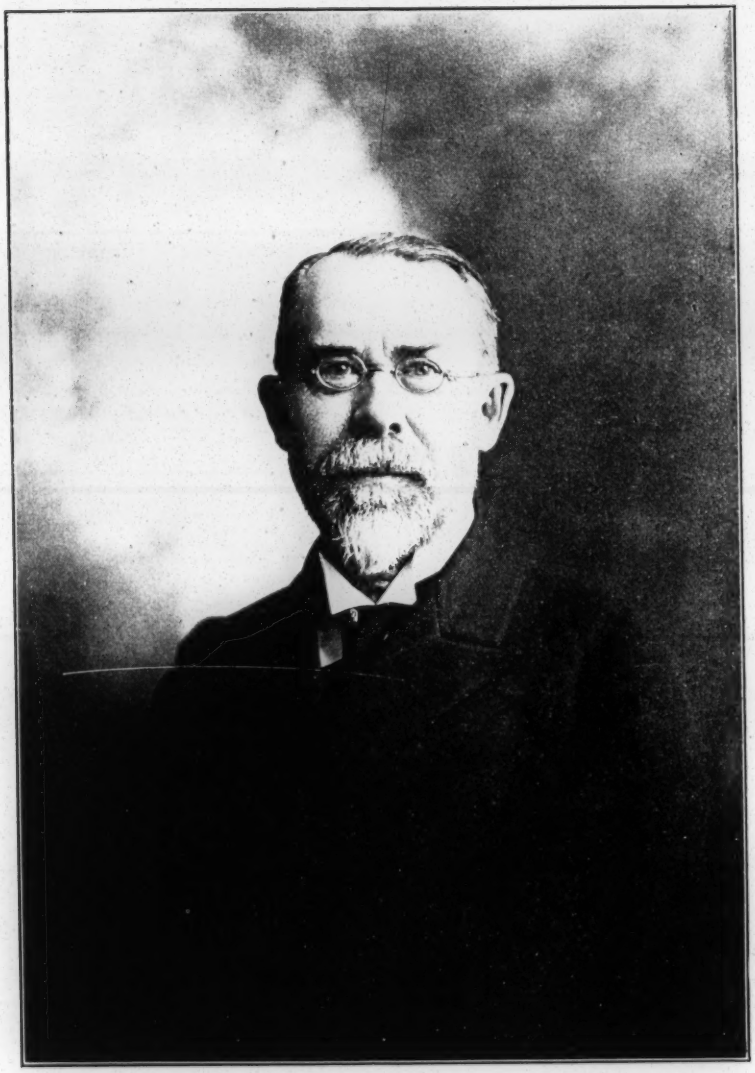
"Commercial Alaska in 1901," by O. P. Austin, Bureau of Statistics, Treasury Department, pp. 3985–3989.

Raleigh Rock—N. E., 3 miles.

Latitude, 25° 57′ 40″ N.
Longitude, 124° 43′ E.

RALEIGH ROCK

THE accompanying photograph of Raleigh Rock was taken by Capt. J. J. Gilbert, commanding the U. S. Coast and Geodetic Survey steamer *Pathfinder*, while on a voyage from Japan to Manila. Raleigh Rock is in latitude 25° 57′ 40″ N. and longitude 124° 43′ E. These rocks have been long known, but different names have been assigned to them under slightly different geographical positions. If the convenient camera had been in use in early days as it is now, the identity of the rocks would easily have been established by shipmasters. So far as known, this is the first photograph of Raleigh Rock that has ever been published.



Sheldon Jackson, LL D.

General Agent of Education in Alaska Since 1885

HENEQUEN—THE YUCATAN FIBER

By E. H. Thompson,

U. S. Consul at Progreso, Mexico

In ancient times the agave, or henequen,* was one of the most important plants of the peninsula.

At a time when most of Europe was in the pall of utter darkness, when the "Parisii" lived in caves and the Gauls in "wattled huts," the priests and rulers of Yucatan lived in stone temples and palaces. Up the steep sides of the myriad pyramids were carried great blocks and sculptured columns.

To move these mighty masses of limestone no powerful engines were at hand, but the Batabs of Yucatan, like the rulers of ancient Egypt, had little use for mechanical devices. Human muscle and ropes of agave (henequen) were all-sufficient. If ten ropes and a hundred slaves were not enough, a hundred ropes and a thousand slaves were not lacking. The ancient artists made use of the fiber in their work. They were not content to make the figure; they made the skeleton, and upon the bones and in the flesh, like the cords and muscles of the body, they placed cords and plaited bands of fiber. Close examination indicates that the fiber used was that of the yaxci plant. Over the imbedded muscles and flesh they placed a thin, hard wash of stucco to represent the skin and surface pigments. The writer has examined many dozen specimens of the broken figures of stucco wherein are plainly shown the casts and the knots and braid, even the very character of the fiber.

The primeval inhabitants probably did not at first attempt to extract the fiber from the thick pulp, but took the leaf and wilted it in the fire, then split it, and used the splits as thongs. The leaves so treated make thongs of great strength, and as they dry they bind with wonderful force. In the primitive forms of habitation in the region, the mud and wattle "nás" are bound together by these shreds of fiber-wilted leaves. They are shapely, water-tight, and durable, and the native builder's only tool is a heavy, sharp-edged knife. Not a spike or nail or metal of any kind enters into the building.

Later the people found that if they cleaned off the thick pulp and the green corrosive juice they could get a firmer hold and so bind tighter. Then they learned to twist the shreds, and this idea led to the making of ropes and cords.

Toward the end of the eighteenth century, when there happened to be a scarcity of hemp for the cordage of the Royal Spanish Navy, search was made for a new material to eke out the supply from Manila. Some one told of the fiber used by the Campeche people in Yucatan. A royal commission was ordered to investigate, and its report, made in 1783, gave unstinted praise to the fiber.

For a few years quite a little henequen was sent to Europe. Then with the collapse of Spanish commerce the demand for it ceased and for half a century its existence seems to have been forgotten by the world.

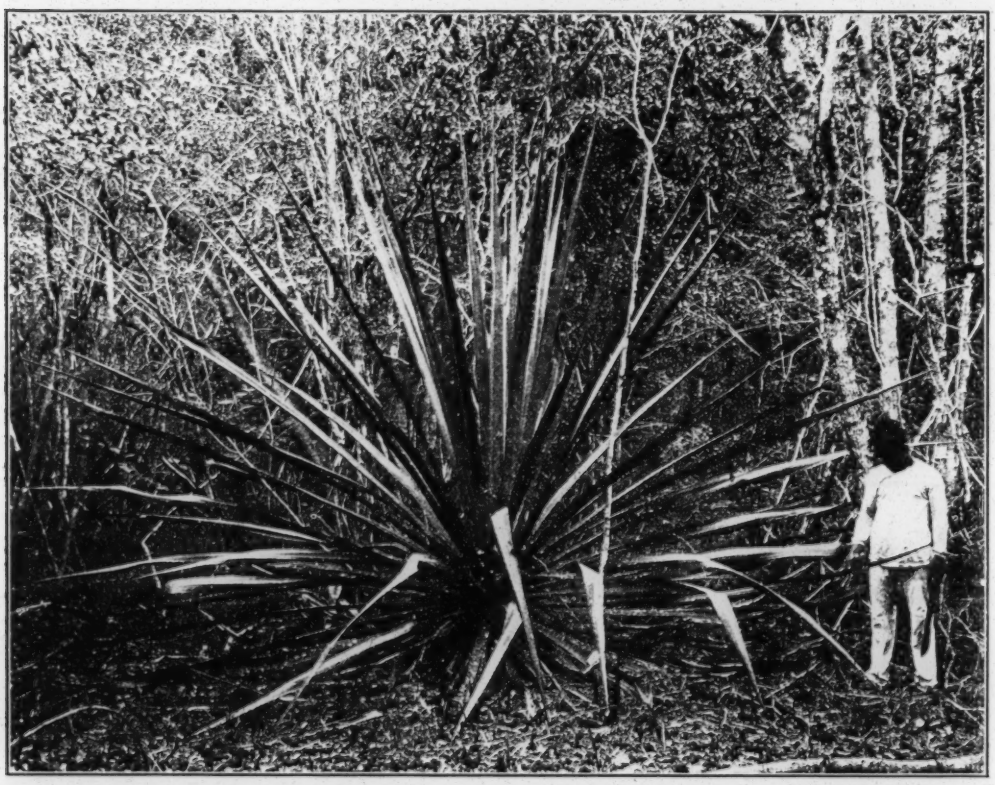
Meanwhile the people of Yucatan grew poorer and poorer until, in their desperation as to how to get money to buy the necessities of life, some bright merchants thought of the fibrous plant which fifty years before had had commercial value. An association was formed and they began to experiment

* The fiber is often called Sisal grass or Sisal hemp, though it is neither a grass nor a hemp. The name "Sisal" was applied to it because it originally reached the outer world through the port of that name.

with the plant. A quantity of fiber was rudely cleaned by native instruments, and, packed in loose bales of about 200 pounds each, was sent to New York. It found a market, but the price was such that there was but scant gain for the seller. The methods of cleaning the fiber were so slow that even with the small wages of the day, the cost per pound to the planter was discouraging. The state government, recognizing the great need of a suitable machine to clean the fiber, offered a gratuity of $10,000 Mexican to the person inventing an apparatus capable of producing a stated output per hour. This finally resulted in the "raspador," the device of a Franciscan friar, which was used for many years.

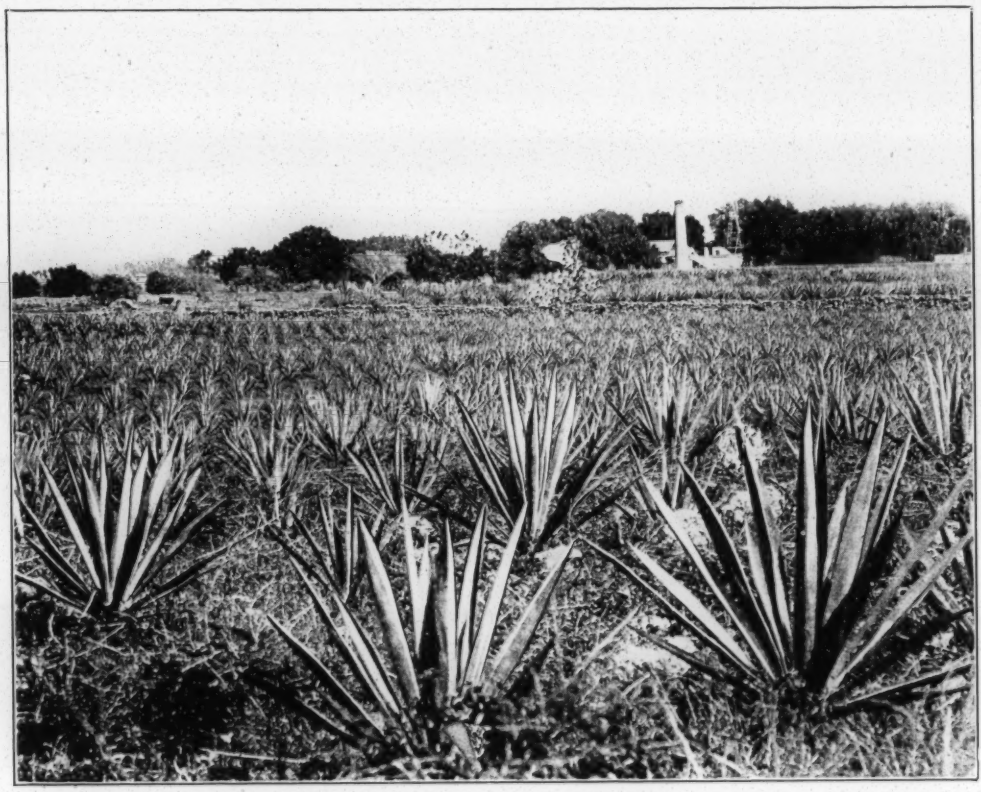
The raspador marked a new era for the commerce of Yucatan. With the aid of this machine, two men could clean in one day more than forty could with the tonkas and pacché. Its use became extended, and henequen farms began to multiply and become prosperous. Today, half a dozen machines are in the market, some of them marvels of design and potency.

The natives of the interior, however, still use the ancient, triangular, sharp-edged piece of wood called the pacché. An able-bodied person can clean with the instrument from 6 to 9 pounds of fiber a day. The fiber obtained thus possesses qualities which that cleaned by machines does not have. In the hammock-making districts of Yucatan



From a photograph by E. H. Thompson

A Wild Variety of Agave Found in the Deep Forests of Yucatan



From a photograph by E. H. Thompson

A Field of Young Sisal Plants—Two Years Old

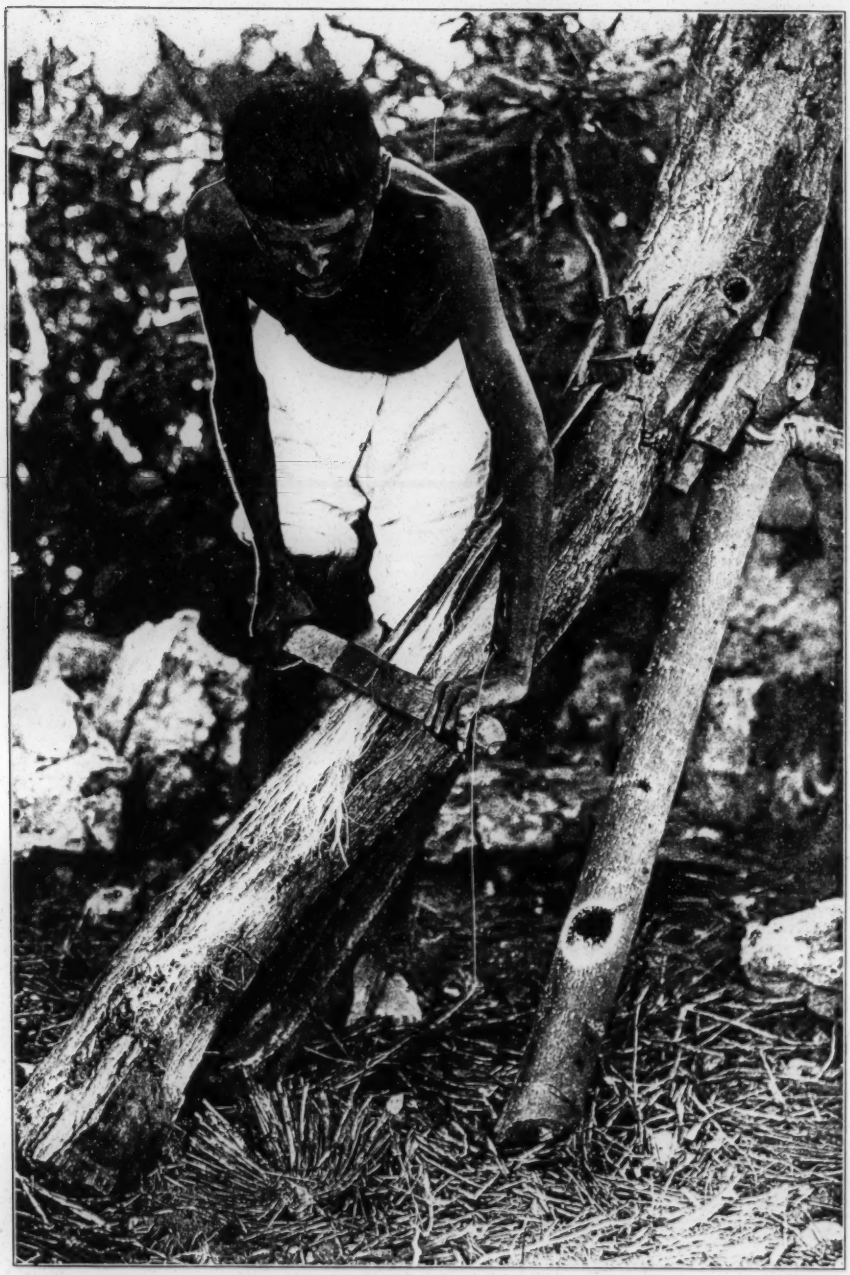
the leaf is cleaned in the ancient method (see illustration on next page), and the makers of the finest hammocks, those worth their weight in silver, will not use a fiber produced by any other method.

THE AGAVE PLANT

The agave is one of the most characteristic plants of Mexico. One of the family, the *Agave americana*, produces the pulque, the intoxicating drink of the country. Great fields are covered with this plant upon the Mexican tableland, and long "pulque trains," like the milk trains of the United States, roll daily into Mexico city.

This beverage is practically unknown to the inhabitants of Yucatan, and the variety that produces it is to be seen only as an exotic in the gardens and parks. Its place is taken by another member of the family, whose importance is more far-reaching. The *Agave sisalensis* furnishes a fiber that not only helps to knit firmer the commerce of the whole world, but binds the sheaves of wheat so that the price of bread in every land is made cheaper for its use.

To the casual observer a field of the pulque plant and one of the fiber plant are very similar in appearance. Both show the same peculiar green, the same many-thorned leaves, but a nearer view soon shows the difference.



From a photograph by E. H. Thompson

A Native in the Interior Cleaning the Fiber by the Ancient Method

From a photograph by E. H. Thompson

1. Tresses of the Sisal Fiber Cleaned by the Pacché (see page 153).
2. Pacché. 3 and 4. Native Implements for Cleaning Fiber

There are three known varieties of the species growing wild in the forests of Yucatan—the chelem, the cahum, and the citamci—and I think that I have found a fourth wild variety during my explorations in the interior. There are also two varieties of the cultivated plant—the yaxci or green fiber, and the sacci or white fiber. The last-named plant is the most cultivated and the one producing the sisal hemp, or henequen, of commerce.

CULTIVATION

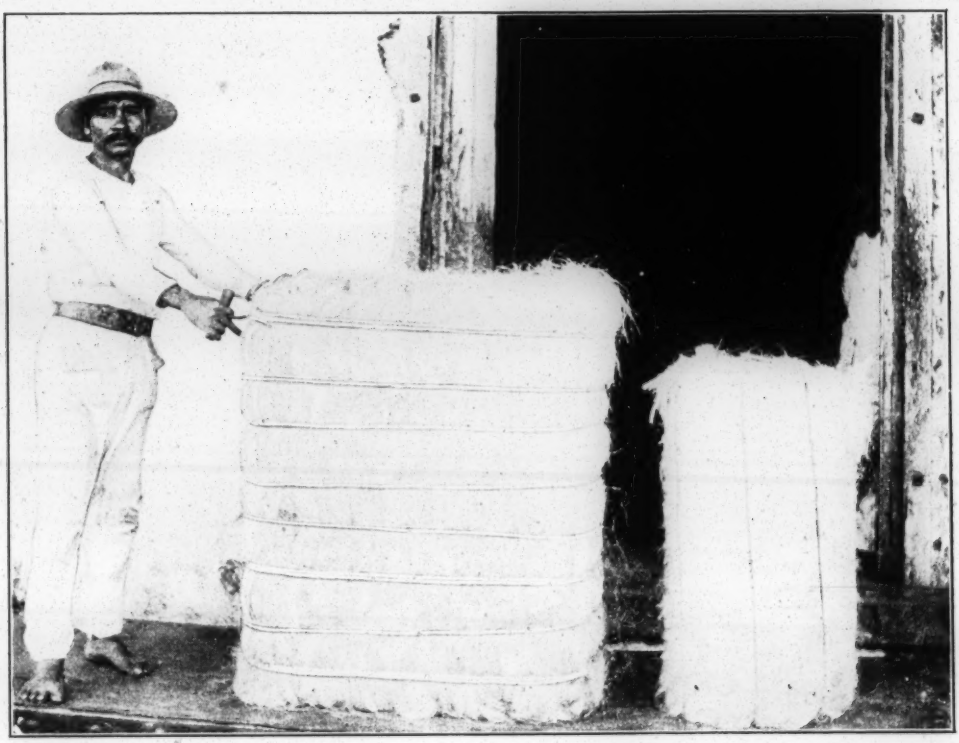
A thin, rocky limestone soil is generally supposed to be the best for the growth of the sacci plant. Experience indicates that the fiber grown upon this class of soil has a percentage of tensile strength greater than that produced on the richer lands, though the last is more flexible and is longer. The percentage of safety allowed by the cordage-makers is so high that I doubt if the diminished tensile strength of the rich-land hemp would seriously affect the quality of the output. Contrary to the general idea, a poor sandy soil is not congenial to the growth of a large, full-sized fiber plant. Few, if any, good-sized, well-formed plants grow very near the coast line. The best Yucatan fiber plant seems to be produced in a zone or belt following the coast, about 12 miles away from it and 70 miles wide.

The plant can be propagated in various ways—by seeds, by cuttings, and by scions or suckers. The first-mentioned method is now never undertaken. Very few of the abundant seeds are fertile, and the time lost in raising the seedlings is great. The second method—by cuttings—is frequently undertaken; the top of an old, nearly worn-out plant is taken just before the long pole that should bear the flowers shoots up. It is cut off and trimmed of all save the newest leaves, and then planted in the ground as though it were a scion. These plants are said to produce earlier than others.

The general method, however, of producing a field of the sisal plant is as follows: A field is cut and the refuse burned; then a month or so before the rainy season the "hijos," or scions of

From a photograph by E. H. Thompson

Drying Sisal Fiber at One of the Large Plantations—Yucatan



From a photograph by E. H. Thompson

Bales of Sisal Fiber Ready for Shipment

sisal, that have sprouted under the shelter of the parent plant, are rooted out of the ground when they get to be 18 or 20 inches high, and thrown in a heap. There they lie for two or three months exposed to the sun and the weather. Just before the rainy season, when they seem to be dried up and decayed, they are carried to the cleared fields and planted in rows. Formerly they so planted the young plants that they were separated by spaces of barely 2 yards, but of late years it has been found best to space them so that they will be in lines, each plant separated from the one preceding it by a space of 1½ yards and the lines 4 yards apart (about 1,100 plants to the acre). Thus, long and wide lanes are formed between the rows that facilitate cutting and carriage of the leaves, and also lessen the wounding of the leaves by the spines and thorns of their neighbors.

Previous to 1889 but little attempt was made to grade the hemp. Yaxci, sacci, short staple, long staple—all went as "sisal." Now, a fine, white fiber, well cleaned and baled, can command a notably better price than mixed fiber, ill-cleaned and badly baled.

The hope of the future is in the careful selection of hemp plants. Many plantations, more by good fortune than otherwise, are stocked with fiber-producing plants of a high order; others are handicapped by plants producing a meager fiber. The quality of the soil in both cases seems to be the same; the

difference is in the class of plants. This phase is a comparatively new one on the plantations of Yucatan fiber and has only recently been taken into serious consideration.

The scion when planted ("anchored" would perhaps be the better word, as it is more often held by heavy stones than by the earth around it), needs no special care or irrigation. Once or twice a season the fields are roughly weeded. The plant thrives, and generally in about five years the earlier leaves commence to extend themselves laterally at right angles to the trunk of the plant. This is nature's signal that the fiber has reached its highest point of tensile strength and that the leaves are ready to be cut. The native cutters then throng the field, and with their corbas deftly cut the leaves close to the trunk, trim off each line of side thorns at a single stroke, snip off the horny end, and bind up the leaves in bundles. Tram cars take these bundles and carry them to the cleaning machine.

THE ENEMIES OF THE PLANT

Fire is its greatest enemy. Hot seasons do not affect it. In fact, the heat of the sun, especially when accompanied by dampness, seems to act as a tonic. It is then, if ever, that the plant recovers from its injuries. The greatest heat experienced in Yucatan for the last ten years was in July, 1900, when the thermometer reached 119° F. in the half shade of a veranda; 147° F. has been experienced in the sun on the principal street of Merida. Long droughts may delay its development, and by wilting the mature leaves cause them to double and injure the fiber, but it cannot stop the ultimate growth of the healthy plant, once it is well rooted. Rainy seasons do not seriously affect the plants, except those in stagnant water. This weakens the plant, but this condition is not common. Cold seasons of the kind that Yucatan experiences do not seriously affect the plant. The coldest known period was in February, 1899, when the thermometer registered 47° F.

But fire conquers it. Let a spark from a locomotive, the lighted end of a cigarette, or the embers of a fire made to heat the bread of the native workers start the flames in an ill-cleaned field, and nothing but a miracle can save the crop from total loss. It is said that some planters in the past have taken advantage of the susceptibility of the plant to artificial heat, and when young plants were desired for export, they were doctored before delivery by having their roots heated over heated embers or dipped into boiling water. The effects of this treatment are not perceptible for a time, and possibly this fact may make clear to some enthusiastic foreign planter why his scions, purchased with so much care and expense, never grew and prospered. Naturally, the Mexicans do not desire to have the plant that is such a valuable product of their country made common.

Next to fire, a large, long-nosed black beetle is the greatest enemy of the cultivated sisal. It is known to the natives as the "max." Dr Gaumer, an American physician residing in Yucatan, whose studies and writings upon the fauna and flora of Yucatan have made his name familiar to naturalists everywhere, at my request writes of the insect:

"The female insect lays its eggs on the trunk of the henequen plant a few inches above the ground. When hatched the larva burrows into and through the outer bark to the harder fiber of the interior, when it generally takes an upward direction and burrows from 6 to 12 inches during its larval existence. When full grown it works its way to the bark, where it changes to a pupa and so remains for some months, when it hatches into the adult beetle and emerges from the plant, which it leaves

injured and weakened, but rarely kills. Three or more larvæ in the same plant will surely destroy it, but that number is of very rare occurrence."

The life of the plant can be greatly prolonged. I have seen fields old at 10 years, and others vigorous and hearty at 19 years. The plants should be originally healthy scions, the leaves must be cut at just the right time, and the long pole must be nipped off before it has become more than a mere protuberance. Once the pole has grown, the plant ages rapidly.

VALUE OF HENEQUEN

The export of henequen is making Yucatan one of the richest states of Mexico. In 1902 the state sent out nearly six hundred thousand bales, or ninety thousand tons, worth $14,000,000. Most of it went to the United States, where it is used for sacking, cordage, and binders' twine.

There will be a falling off in the supply for the season of 1903. The causes of this diminishing output, despite the high prices that prevail, will be the decreasing acreage of new fields. Laborers are scarce, and the great majority of planters dislike to stop cleaning fiber long enough to plant new fields or replant old ones. *

* For the illustrations that accompany this article the NATIONAL GEOGRAPHIC MAGAZINE is indebted to Hon. Frederic Emory, Chief of the Bureau of Foreign Commerce, State Department.

A REPORT OF THE ERUPTION OF THE SOUFRIERE OF ST VINCENT, 1812

FROM THE EVENING NEWS OF JUNE 30, 1812 *

THE Soufrière mountain, the most northerly of the lofty chain running through the center of this island, and the highest of the whole, as computed by the most accurate survey that has yet been taken, had for some time past indicated much disquietude; and from the extraordinary frequency and violence of earthquakes, which are calculated to have exceeded 200 within the last year, portended some great movement or eruption. The apprehension, however, was not so immediate as to restrain curiosity, or to prevent frequent visits to the crater, which of late had been more numerous than at any former period, even up to Sunday last, the 26th of April, when some gentlemen ascended it, and remained there for some time. Nothing unusual was then remarked, or any external difference observed, except rather a stronger emission of smoke from the interstices of the conical hill at the bottom of the crater. To those who have not visited this romantic and wonderful spot, a slight description, as it lately stood, is previously necessary and indispensable to form any conception of it and to the better understanding the account which follows, for no one living can expect to see it again in the perfection and beauty in which it was on Sunday, the 26th instant. About

* This account has been copied from the reprint of the original article as published in "An Account of the Eruptions of the Saint Vincent Soufrière," by P. Foster Huggins. The account is of the highest interest and value as showing the exact parallelism between the eruptions of 1812 and 1902. The "lava" streams mentioned here were mud flows. Mr Huggins' pamphlet was printed at the *Times* printing office, Kingstown, St Vincent, July, 1902.—E. O. HOVEY.

2,000 feet from the level of the sea (calculating from conjecture on the south side of the mountain) and rather more than two-thirds of its height, opens a circular chasm, somewhat exceeding half a mile in diameter and between 400 or 500 feet in depth. Exactly in the center of this capacious bowl rose a conical hill about 260 or 300 feet in height, and about 200 in diameter, richly covered and variegated with shrubs, brushwood, and vines about half way up, and for the remainder powdered over with virgin sulphur at the top. From the fissure in the cone and interstices of the rocks, a thin white smoke was constantly emitted, occasionally tinged with a slight bluish flame. The precipitous sides of this magnificent amphitheater were fringed with various evergreens and aromatic shrubs, flowers, and many Alpine plants. On the north and south sides of the base of the cone were two pieces of water, one perfectly pure and tasteless, the other strongly impregnated with sulphur and alum. This lonely and beautiful spot was rendered more enchanting by the singularly melodious notes of a bird, an inhabitant of those upper solitudes, and altogether unknown to the other parts of the island; hence principally called or supposed to be invisible, though it certainly has been seen, and is a species of the merle. A century had now elapsed since the last convulsion of the mountain, or since any other elements had disturbed the serenity of this wilderness, than those which are common to the tropical tempest. It apparently slumbered in primeval solitude and tranquillity, and from the luxuriant vegetation and growth of the forest which covered its sides from the base nearly to the summit, seemed to discountenance the face and falsify the records of the ancient volcano. Such was the majestic, peaceful Soufrière of April 27th; but we trod on *ignes suppositos cineri doloso*, and our imaginary safety was soon to be confounded by the sudden danger of devastation.

Just as the plantation bells rang twelve at noon, on Monday, the 27th, an abrupt and dreadful crash from the mountain, with a severe concussion of the earth and tremulous noise in the air, alarmed all around it. The resurrection of this fiery furnace was proclaimed in a moment by a vast column of thick, black, ropy smoke, like that of an immense glass house, bursting forth at once, and mounting to the sky, showering down sand with gritty, calcined particles of earth and favilla mixed, on all below. This, driven before the wind towards Wallibou and Morne Ronde, darkened the air like a cataract of rain, and covered the ridges, woods, and canepieces with light, gray-colored ashes, resembled snow when slightly covered by dust. As the eruption increased, this continued shower expanded, destroying every appearance of vegetation. At night a very considerable degree of ignition was observed on the lips of the crater, but it is not asserted that there was as yet any visible ascension of flame. The same awful scene presented itself on Tuesday, the fall of favilla and calcined pebbles still increasing, and the compact, pitchy column from the crater rising perpendicularly to an immense height with a noise at intervals like the muttering of distant thunder. On Wednesday, the 29th, all these menacing symptoms of horror and combustion still gathered more thick and terrific for miles around the dismal and half-obscured mountain. The prodigious column shot up with quicker motion, dilating as it rose like a balloon. The sun appeared in total eclipse, and shed a meridian twilight over us that aggravated the wintry gloom of the scene now completely powdered over with falling particles. It was evident that the crisis was yet to come; that the burning fluid was struggling for a vent, and laboring to throw off the superincumbent strata

and obstructions which suppressed the ignivomous torrent. At night it was manifest that it had greatly disengaged itself from its burden by the appearance of fire flashing now and then, flaking above the mouth of the crater.

On Thursday, the memorable 30th of April, the reflection of the rising sun on this majestic body of curling vapor was sublime beyond imagination. Any comparison of the glaciers of the Andes or Cordilleras with it can but feebly convey an idea of the fleecy whiteness and brilliancy of this awful column of intermingled and wreathed smoke and clouds. It afterwards assumed a more sulphureous cast, like what we call thunder clouds, and in the course of the day a ferruginous and sanguine appearance with much livelier action in the ascent, a more extensive dilation, as if almost freed from every obstruction. After noon the noise was incessant and resembled the approach of thunder, still nearer and nearer, with a vibration that affected the feelings and hearing; as yet there was no convulsive motion or sensible earthquake. Terror and consternation now seized all beholders. The Caribs, settled at Morne Ronde at the foot of the Soufrière, abandoned their homes with their live stock and everything they possessed, and fled precipitately towards the town. The negroes became confused, forsook their work, looked up to the mountain, and, as it shook, trembled with dread of what they could neither understand nor describe; the birds fell to the ground, overpowered with the showers of favilla, unable to keep themselves on the wing; the cattle were starving for want of food, as not a blade of grass or a leaf was now to be found; the sea was much discolored, but in nowise uncommonly agitated, and it is remarkable that throughout the whole of the violent disturbance of the earth it continued quite passive, and did not at any time sympathize with the agitation of the land. About 4 o'clock p. m. the noise became more alarming, and just before sunset the clouds reflected a bright copper color, suffused with fire. Scarcely had the day closed when the flame burst at length pyramidically from the crater through the mass of smoke; the rolling of the thunder became more awful and deafening; electric flashes quickly succeeded, attended with loud claps, and now indeed the hurly-burly began. Those only who have witnessed such a sight can form any idea of the magnificence and variety of the lightning and electric flashes; some forked zigzag playing across the perpendicular column from the crater, others shooting upwards from the mouth-like rockets of the most dazzling luster, others like shells with their trailing fuses flying in different parabolas, with most vivid scintillations from the dark, sanguine column which now seemed inflexible and immovable by the wind.

Shortly after 7 o'clock p. m. the mighty cauldron was seen to simmer, and the ebullition of lava to break out on the northwest side. This, immediately after boiling over the orifice and flowing a short way, was opposed by the activity of a higher point of land, over which it was impelled by the immense tide of liquefied fire, that drove it on forming the figure V in grand illumination. Sometimes when the ebullition slackened, or was insufficient to urge it over the obstructing hill, it recoiled back, like a refluent billow from the rock, and then again rushed forward, impelled by fresh surprise, and scaling every obstacle, carrying rocks and woods together in its course down the slope of the mountain, until it precipitated itself down some vast ravine concealed from our sight by the intervening ridges of Morne Ronde. Vast globular bodies of fire were seen projected from the fiery furnace, and bursting, fell back into it, or over it, on the surrounding bushes, which were instantly

set in flames. About four hours from the lava boiling over the crater it reached the sea, as we could observe from the reflection of the fire and the electric flashes which attended it.

About half-past one another stream of lava was seen descending to the eastward towards Rabacca. The thundering noise of the mountain and the vibration of sound that had been so formidable hitherto now mingled in the sullen monotonous roar of the rolling lava, became so terrible that dismay was almost turned into despair. At this time the first earthquake was felt. This was followed by showers of cinders that fell with the hissing noise of hail during two hours. At three o'clock a rolling on the roofs of the houses indicated a fall of stones, which soon thickened and at length descended in a rain of intermingled fire that threatened at once the fate of Pompeii and Herculaneum. The crackling and coruscations from the crater at this period exceeded all that had yet passed. The eyes were struck with momentary blindness, and the ears stunned with the glomeration of sounds. People sought shelter in cellars, under rocks, or anywhere, for everywhere was nearly the same, and the miserable negroes, flying from their huts, were knocked down or wounded and many killed in the open air. Several houses were set on fire. The estates situated in the immediate vicinity seemed doomed to destruction. Had the stones that fell been proportionally heavy to the size, not a living creature could have escaped without death. These having undergone a thorough fusion, they were divested of their natural gravity, and fell almost as light as pumex, though in some places as large as a man's head. This dreadful rain of stones and fire lasted upwards of an hour, and was again succeeded by cinders from three till six o'clock in the morning. Earthquake followed earthquake almost momentarily, or rather the whole of this part of this island was in a state of continued oscillation, not agitated by shocks vertical or horizontal, but undulated like water shaken in a bowl. The break of day, if such it would be called, was truly terrific. Darkness was only visible at eight o'clock, and the birth of May dawned like the day of judgment. A chaotic gloom enveloped the mountain and an impenetrable haze hung over the sea, with black sluggish clouds of a sulphureous cast. The whole island was covered with favilla, cinders, scoria, and broken masses of volcanic matter. It was not until the afternoon the muttering noise of the mountain sunk gradually into a solemn yet suspicious silence.

GEOGRAPHIC NOTES

EXPLORATIONS AMONG THE WRANGELL MOUNTAINS, ALASKA

MESSRS T. G. Gerdine and D. C. Witherspoon, of the U. S. Geological Survey, as one of the results of their topographic work in the Copper River basin, Alaska, during the seasons of 1900 and 1902, have developed some most interesting facts concerning a great group of peaks called the Wrangell Mountains, whose slopes are drained by tributaries of the Copper, the Tanana, and the White rivers. The western end of this group was located roughly by Lieut. Allen in 1885, in connection with his reconnaissance through central Alaska, and his descriptions gave the first conception of the altitude and importance of the group.

Messrs Gerdine and Witherspoon, however, have mapped accurately and in

detail the entire range. They have determined incidentally that it includes at least eight peaks, with altitudes of 12,000 feet or more, and several other summits which rise to above 10,000 feet. Two of these peaks, Mount Blackburn and Mount Sanford, are over 16,000 feet in height, but the most interesting of all is perhaps the active volcano, Mount Wrangell, 14,000 feet high. This peak is a great, flat volcanic dome, whose crater near the summit is 8,000 feet above the line of perpetual snow. At irregular but frequent intervals, puffs of steam and smoke, with showers of fine cinder, issue from this crater, and as a result many of the glaciers flowing from its southwestern slope are black with the included soot and ash instead of being clear blue, like glacial ice generally.

Detailed topographic maps, showing the location, relative positions, forms, and altitudes of the various peaks of the range, are in course of preparation and will be issued soon with geologic reports of the region. A table of altitudes of a few of the highest peaks is presented:

Mt Sanford	16,208
Mt Blackburn	16,140
Mt Wrangell	14,005
Mt Regal	13,400
*Mt Jarvis	12,230
Mt Drum	12,002

SCOTTISH ANTARCTIC EXPEDITION

THE Chief of the U. S. Weather Bureau has just received a letter from the Scottish Antarctic Expedition, dated January 24th at the Falkland Islands, acknowledging the receipt of assistance from the Weather Bureau. The writer, Mr R. C. Mossman, meteorologist to the expedition, states: "We leave here tomorrow on the Antarctic ship *Scotia* for the Weddell Sea,* pushing south along the 30th parallel of west longitude and wintering in the ice. We do not expect to return here before February or March of next year (1904). I hope to be able to contribute something to the United States Monthly Weather Review. We shall concentrate on kite work as much as circumstances permit, as we have a complete outfit of meteorographs, kites, etc., on board. (This outfit is modeled after that of the U. S. Weather Bureau.) There is, we believe, some possibility of losing a record by the freezing of the ink, as we have not the newly invented ink containing tonsol."

SURVEY OF THE GRAND CANYON

THE demand from scientists and tourists for an accurate and detailed map of the famous Grand Canyon of the Colorado has led to a resurvey of this region by the United States Geological Survey, under the charge of Francois E. Matthes, topographer. The Grand Canyon, formerly reached only by a stage route over a desert country, has recently been made accessible by a branch line from Williams, and during the one year that this road has been in operation the canyon has been visited by thousands of tourists.

The survey plans to publish a series of atlas sheets covering the entire extent of the Grand Canyon proper and

*Named for Lieut. David H. Jarvis, Collector of Customs, Sitka, Alaska, and leader of the Point Barrow overland expedition of 1897–'98.

*The Weddell Sea, so named after Captain James Weddell, who made numerous sealing voyages and wrote on the possibility of reaching the South Pole. According to the eminent geographer, E. S. Balch, of Philadelphia, in his latest book, "Antarctica," Weddell Sea was originally called George the Fourth's Sea by Captain Weddell. He sailed over it in 1823 and found not a particle of ice, and he thought it a portion of the Antarctic Polar Sea. It probably represents only the southern end of the Atlantic Ocean, between the meridian of Greenwich and longitude 60° W. According to Weddell's voyage, this region was all open water as far south as latitude 75° south.

considerable areas of the high plateaus on either side. The first of these sheets, known as the Bright Angel, will be available to the public some time this summer. It includes almost all of the scenery visible from the Bright Angel Hotel, familiar to every visitor. The new map will be on a scale of one mile to the inch, and the contour interval will be 50 feet. It will show every pinnacle, spur, and gully in its true proportions, and each line of cliff and terrace may be traced along the canyon walls.

The dimensions of the Grand Canyon have been the subject of much discussion ever since it was first explored. It is therefore interesting to see some of the figures of this latest survey. The average width from rim to rim does not exceed 10 miles throughout the Kaibab, or widest section of the canyon, and frequently narrows down to 8 miles. The river does not occupy the middle of the gigantic trough, but flows at a distance varying between 1 and 3 miles from the south side. Practically all of the magnificently sculptured pinnacles and mesas (the so-called temples) lie north of the river, and at distances of from 5 to 7 miles from the view-points usually visited by tourists. The depth of the Grand Canyon, in one way, has been overstated, in another understated. Measured from the south rim, the total depth is considerably less than a mile. From the rim at the Bright Angel Hotel, where the altitude is 6,866 feet above sea-level, to the high-water mark of the river at the foot of the tourist rail, the drop is 4,430 feet. The highest point on the south rim at the Grand View Hotel is 7,496 feet, about 4,900 feet above the river. From the north side, however, the drop to the water level averages considerably over a mile, and in many places even exceeds 6,000 feet. It may be stated in a general way that the north rim is from 1,000 to 1,200 feet higher than the south, thus producing that high, even skyline so striking in all views. These figures are based on spirit-levels run in connection with the map work. They are the first that have ever been run to the bottom of the chasm, and the high standard of accuracy maintained throughout will cause them to be considered authoritative and final.

GEOGRAPHY IN THE UNIVERSITY OF CHICAGO

THE University of Chicago has established a Department of Geography, and Prof. Rollin D. Salisbury, of the Department of Geology, has been placed at its head. The arrangement between the Departments of Geology and Geography is such that Professor Salisbury retains his connection with the former, as heretofore, at the same time that he assumes the headship of the latter. The close connection of the two departments appears from the fact that Professor Salisbury will also act as head of the Department of Geology when Professor Chamberlin is not in residence, and Professor Chamberlin will act as head of the Department of Geography in Professor Salisbury's absence.

The Department of Geology has heretofore offered courses, both elementary and advanced, in physical geography, and elementary courses in meteorology. Other courses of a geographic character have been offered by other departments, notably geographic botany by the Department of Botany, zoögeography by the Department of Zoölogy, and commercial geography by the Department of Political Economy. These courses will continue to be given as heretofore by these several departments, except that meteorology will be under the auspices of the new department. The new department will not duplicate the geographic courses already given, but will, at the outset, provide courses which

supplement those already established. The immediate aim of the new department will be to occupy the ground intermediate between geology and climatology, on the one hand, and history, sociology, political economy, and biology, on the other. The courses offered at the outset will be those for which, within this field, there is greatest demand.

John Paul Goode, Ph. D., in charge of the work of geography in the Wharton School in the University of Pennsylvania, has accepted an assistant professorship in the Department of Geography, and will begin his work the second term of the summer quarter (July 27, 1903). No other appointment will be made this year. During his first year Dr Goode will be in residence during the second term of the summer quarter, and during the autumn and spring quarters. The courses which he will give during the first year will include courses on the economic geography of (1) North America, (2) Europe, and (3) tropical countries. The central theme of these courses will be the influence of the physiography, the climate, and the natural resources of these lands on their settlement, development, and present commercial and industrial status. Research courses will also be offered for advanced students.

The geographic work of the university during the coming year will include the following courses, in addition to those given in the Department of Geography:

I. In the *Department of Geology.*—1, an elementary course in physiography each quarter; 2, a local field and laboratory course, first term, summer quarter; 3, two field courses in geology and geography about Devils Lake and the Dells of the Wisconsin, in Wisconsin, one month each, commencing June 18 and July 27 respectively; 4, a course in advanced physiography, autumn quarter; 5, a field course (for advanced students) in the Wasatch Mountains of Utah and vicinity.

Other courses which, while primarily geological, are fundamental to the proper conception of the evolution of the present geography of the continents, will also be given in this department.

II. In the *Department of Zoölogy.*—Courses in zoögeography, summer and spring quarters.

III. In the *Department of Botany.*—1, an elementary course in plant geography (time not announced); 2, an elementary course in ecology, summer and spring quarters; 3, elementary and advanced courses in field botany, summer and spring quarters; 4, advanced courses in geographic botany, winter quarter; 5, a course in physiographic ecology, summer and spring quarters.

IV. In the *Department of Political Economy.*—Courses in commercial geography, summer, autumn, and winter quarters.

School of Education.—In addition to the foregoing, courses in geography will be given by Miss Baber in the School of Education (the Normal Department of the University). These courses are planned primarily with reference to the needs of teachers in the grades. Miss Baber will also conduct a field course of one month's duration during the second term of the summer quarter, beginning July 27.

THE ASCENT OF MT EVEREST

A SERIOUS attempt is about to be made, writes Herbert C. Fyfe in the *Scientific American*, to ascend the highest mountain in the world, Mt Everest, which rears its stately head 29,002 feet above the level of the sea.

The highest point to which man has so far climbed is 23,080 feet. This is the height of Aconcagua, the loftiest summit of the main cordillera of the Andes. Aconcagua was scaled by the famous guide, Mathias Zurbrigger, and

Mr Vines, two members of the expedition sent out by the Royal Geographical Society in 1887 under Mr E. A. Fitzgerald, who himself failed to reach the summit. Before this event the record was held by Sir William Martin Conway's expedition, which in 1892 climbed a mountain in the Karakoram Himalayas 22,600 feet high. Mr W. Graham in 1883 claimed to have ascended Kabru (24 015 feet), but his claim is generally disallowed. The new expedition, which has just started for the Himalayas, is under the direction of Mr Eckenstein. Very few details regarding the plan of operations can be ascertained, but it is known that Mr Eckenstein and his companions have set before themselves the task of ascending to the loftiest peak of the two highest mountains not only in the Himalayas, but also in the world, Mt Everest (29,002 feet) and "K 2" (28,250 feet).

There is nothing impossible in scaling Mt Everest. Two things are wanted, time and money; and provided these are forthcoming, success may very well be looked for.

Most of the great climbers of today agree in affirming that man could exist at an altitude of 29,000 feet, provided of course that careful precautions were taken and that all the details of the expedition were worked out in a thoroughly practical manner. The climber must not attempt to ascend Mt Everest right off. He will have to take some years over it, climbing each year to a certain height and resting weeks here and there on the road in order to accustom his body to the unwonted altitudes. Supplies will be a great problem, but if he can manage to insure food, clothing, and other necessaries reaching him at the various camps at which he will be forced to remain for some little time, and if he is strong enough to withstand the cold and the rarefied atmosphere, it is possible that one day his ambition will be satisfied and that he will be able to take his stand on the highest point of the earth's surface and to rejoice in the fact that he has accomplished something which no one else has ever done since the world began.

IRRIGATION PLANS IN FIVE STATES

SECRETARY HITCHCOCK, of the Department of the Interior, on the recommendation of the Director of the Geological Survey, has granted authority for the acquisition of necessary property, rights of way, etc., preliminary to the construction of irrigation works in five localities under authority of the reclamation act approved June 17, 1902.

The construction is, of course, conditional on the department obtaining the necessary rights and adjusting private claims in such manner as to comply with the provisions of the act. The five projects referred to are as follows:

Wyoming—Sweetwater dam.
Montana—Milk River project.
Colorado—Gunnison tunnel.
Nevada—Truckee project.
Arizona—Salt River reservoir.

These projects are estimated to cost $7,000,000 and will provide for the irrigation of about 600,000 acres of arid land. The examinations of all these projects have been made in sufficient detail to justify estimates of cost and results. Several other projects in other states are well advanced, and it is expected that further recommendations can be made after the close of the coming field season.

The Secretary has also authorized the expenditure during the present calendar year of $450,000 upon surveys, borings for foundations, and other examinations which will be carried on in all of the states and territories included within the provisions of the law. There is now in the Treasury about ten million dollars obtained by the sale of public lands since July 1, 1900, and available for the reclamation of arid lands in the thirteen states and territories named in the reclamation law.

INTERNAL COMMERCE OF THE UNITED STATES

THE internal commerce of the United States for 1902 reached twenty billions of dollars, or, in other words, equaled the entire international commerce of the world. This is the gratifying estimate of the Treasury Bureau of Statistics, whose duty it is to gather the facts and figures of our enormous internal trade. Hon. O. P. Austin states that in arriving at this estimate of $20,000,000,000 for the internal commerce of the United States, the Bureau includes only one transaction in each article produced, while in fact a very large number of the articles produced pass through the hands of several "middlemen" between those of the producer and those of the consumer. The estimate is based upon the figures of the census, which put the total value of manufactures in 1900 at $13,000,000,000, those of agriculture at nearly $4,000,000,000, and those of minerals about $1,000,000,000. Adding to these the product of the fisheries, the total value of the products of the great industries in 1900 would be eighteen billions of dollars, and the rapid growth in all lines of industry since 1900, especially in manufacturing, seems to justify the conclusion that even a single transaction in all the products of the country would produce an aggregate for 1902 of fully twenty billions of dollars. Our internal commerce was ten times larger in 1902 than in 1850, while our population was only three and one-half times as great.

RECLAMATION IN WYOMING AND COLORADO

MR FRED BOND, state engineer of Wyoming, in his latest official report describes some experiments being made in Colorado and Wyoming to grow wheat without irrigation.

In 1886 Mr Robert Gauss advanced the theory that wheat could be acclimatized and made to thrive under the arid conditions of Colorado, and some years later began conducting experiments to test his theory. In 1896 he planted some improved Fife wheat, but secured at harvesting time but little more than seed enough for the following year. This seed was planted and the experiment continued each year with better and better results. In the spring of 1902 Mr Bond obtained a pint of this seed and planted one-half near Cheyenne at an altitude of 6,050 feet above sea-level, and the remainder near Buffalo, Johnson county, at an altitude of 4,700 feet. From the harvest of the first lot Mr Bond obtained 9½ pints, a yield of nineteenfold, and from the second lot 21½ pints, or about forty-threefold, although there had been no irrigation of either lot. The effective precipitation at Cheyenne had been 6.38 inches and at Buffalo 4.90 inches.

If experiments on a larger scale are equally successful, if as good wheat and as great results are obtained in practical farming, Mr Gauss has reclaimed an area of nearly 400,000 square miles, stretching from the southern boundary of Kansas and Colorado to the Canadian boundary.

DEPARTMENT OF COMMERCE AND LABOR

THIS new department, after June 30, 1903, will include the following bureaus:

Bureau of Statistics;
Coast and Geodetic Survey;
Bureau of Immigration;
Bureau of Navigation;
Light-House Board and Establishment;
Steamboat Inspection Service;
U. S. Shipping Commission;
National Bureau of Standards, transferred from the Treasury Department;
Census Office, transferred from the Interior Department;

Bureau of Foreign Commerce, transferred from the State Department;

The unattached bureaus of the Fish Commission and the Department of Labor;

And the newly created Bureaus of Manufactures and of Corporations.

The law which created the Department of Commerce and Labor also gave the President authority to transfer to the new department from the other departments, excepting the Agricultural, any statistical or scientific bureau.

THE POSSIBILITIES OF SOUTHERN APPALACHIAN STREAMS

OWING to the growing importance of the Southern Appalachian Mountain region as a source of supply for many streams upon which depend important industries of the South, the United States Geological Survey has been making a systematic study of the water-courses which there take their rise. No other region in the eastern part of the United States is so important as a gathering ground for widely distributed streams. Its copious rainfall, amounting in places to 72 inches, with an average for the whole region of about 53 inches, together with its steep grade and large proportion of forests, makes it a unique gathering ground for streams which flow eastward into the Atlantic and westward and southward into the Gulf of Mexico. The work of the Survey has been directed to the measurement of all the important rivers of the district, including the New, Yadkin, Catawba, Broad, Saluda, French Broad, Nolichucky, Watauga, Holston, Big Pigeon, Nottely, Chestatee, Toccoa, Conasauga, Coosawattee, Cartecay, Ellijay, Hiwassee, and Etowah.

In the study made of these watersheds special attention was given to the normal flow and the yearly variations in the discharge of the streams, the developed and undeveloped water powers, the springs in the basins, the sources and quality of the water, and the general characteristics of the topography, rocks, and soil. Consideration was also given to the minerals, mines, forest areas, rainfall, and climate, as well as to the means of lumbering and of transportation. The data thus collected will be made available for engineers, manufacturers, and others needing information concerning the water resources of the region.

MONT PELÉE

REPORTS from Martinique indicate that Mont Pelée continues active. Prof. Angelo Heilprin states that between the time he left the island, September 6, 1902, and December 16, 1902, the mountain increased in height bodily about 950 feet according to measurements which have been sent him. During January a severe eruption occurred which tore away the larger part of this increase, but since then the mountain has been steadily gaining in height again. A notable phenomenon about the volcano is a narrow obelisk which has been thrust forcibly and gradually through the throat of the volcano to a height of some 200 feet. The obelisk is incandescent, pointed like a needle, and would appear from Lacroix's observations to be of a lavæ-form nature. Mont Pelée has now been in a state of unceasing disturbance, more or less active, since the great catastrophe of May 8, 1902—in fact since several weeks before that day.

Professor Heilprin plans to return to Martinique shortly to continue his personal examination of the volcano. He is at present engaged in enlarging his volume, "Mont Pelée and the Tragedy of Martinique," for a second edition.

The Census of China, recently completed, shows the enormous total population of 426,447,000, according to the cabled reports. The number of inhabitants in Manchuria, Mongolia, Tibet, and Turkestan were only estimated. Thus more than one-fourth of the in-

habitants of the world are contained within the Chinese Empire. Even the British Empire with its vast possessions on every continent has 30,000,000 less inhabitants than China. In 1890 Mr E. G. Ravenstein estimated the inhabitants of the earth at 1,487,900,000. Since then the number has increased at least 62,100,000, making a present total of 1,550,000,000.

The British Empire, including India and the recently acquired possessions in South Africa, contains 396,105,000 people; the Russian Empire comes next, with less than one-third as many, 129,004,000; the United States, including our island possessions, numbers about 89,000,000; France and her colonies have 65,166,000, and the German Empire 56,367,000. No other country passes the fifty-million mark.

The San Jose Scale, which is so destructive to fruit trees in certain sections of the western United States, was the subject of a recent lecture by Charles L. Marlatt before the Biological Society of Washington. Mr Marlatt was sent to Japan and China by the Department of Agriculture to study this pest and to discover some means of checking it. In Japan he found the scale only in those parts where trees had been imported from American nurseries. In China, however, around Tientsin and Pekin and along the northern coast, he found the scale on nearly all the trees, and as it existed in parts where there had been no importations from America, he concluded that it was a native of China. Further studies convinced him that the scale was held in check by a red-spotted beetle, which ate the insects. Mr Marlatt wisely arranged for the capture of a great many of the red-spotted beetles, which were brought to the United States and distributed among those sections that were specially infested by the scale. It is hoped that the beetles will increase rapidly enough to check the spread of the scale.

The Outing of the Mazamas for 1903 will be held at the Three Sisters, a triple peak in Lane County, Oregon, with an elevation of nine thousand feet. Members of the club rendezvous at Portland, leaving that city July 8 and Eugene July 9. The ascent of the peak is planned for July 13 or 14. The party return via Clear Lake and Lebanon (the old Military Road) in time for those who wish to join the Sierra Club in the ascent of Mt Shasta on July 25. It will be remembered that the requirement for admission into the Mazamas is the ascent of at least one snow-capped peak of formidable height.

Bingham, Utah, Mining District.—The report of the U. S. Geological Survey on the areal and economic geology of the Bingham Canyon district, Utah, by Arthur Keith and J. M. Boutwell, is now nearing completion. It embodies four main parts, which are devoted to history and development, surface geology, economic geology, and detailed descriptions of mines. Bingham is the oldest camp in the state and the only one in which placer mining has proved successful.

A map of the dairy region of New York State has been published by the Geological Survey. It is called the Norwich sheet, and includes the thriving city of Norwich and the towns of Smyrna and Plymouth, as well as portions of the towns of North Norwich, Sherburne, Otselic, Pharsalia, McDonough, and Preston. A narrow strip of the southern part of Madison County, including parts of the towns of Hamilton, Lebanon, and Georgetown appears on the northern part of the sheet.

The country is very hilly and the scenery picturesque. The character of the region is so accurately shown on the map that by the contour lines it is easy to pick out the elevation above sea-level of any particular house, as well as of the hills about it.

THE

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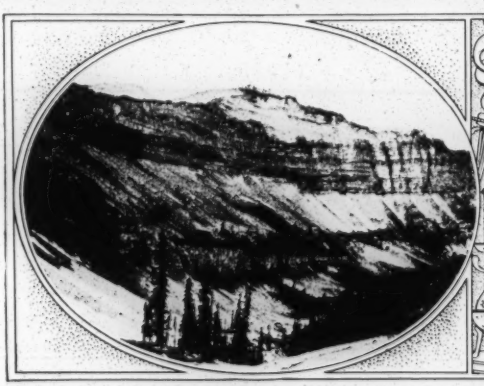

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